SEASONAL SKY MAPS

Looking up at the night sky you will probably see a disorderly, scattered arrangement of stars, but anyone who observes more frequently will start to see that the stars do not change places in relation to each other. Long ago, people began giving names to these fixed groupings of stars, and today we refer to these groups as *constellations*. Most people recognize one or two constellations; for example, they probably know what the Big Dipper (or Plough), a part of the Great Bear constellation, looks like. But why is it always in a different position in the sky? And why can't you find Orion during a night in June or July? This changing aspect of the sky is often confusing to the casual stargazer. So, the first thing you have to learn is how the sky moves.

It is important to know that the star patterns themselves do not change, at least not in a single human life span. It is only over a period of centuries that the positions of some neighboring stars change in a way that can be detected with the unaided eye. All these groupings of stars and constellations can be regarded as being fixed to a huge imaginary sphere, with the Earth placed in the center. No matter where on Earth you are, you can always see just one half of this sphere. So it is not hard to understand that, when you move to another part of the Earth, the visible half of the celestial sphere also changes. If you stand at the North Pole you will only see the northern half of the heavens, while at the South Pole you will see only the southern half. But there is more to it than that. Two more factors affect the appearance of the sky. Firstly there is the daily rotation of the Earth around its axis, which causes the Sun to rise in the east and set in the west. The same thing happens with the other objects in the sky. In fact, it appears to us as if the entire heavenly sphere rotates around an axis that is an extension of the Earth's axis. Apart from that there is the orbital movement of the Earth, which makes the appearance of the sky change over the seasons. If you look at one constellation, let us say Orion, at midnight on the first day of January and take note of its position, and then look every successive night at about the same time, you will notice that the stars reach the same position a few minutes earlier each night. One month later, on the first day of February, Orion will already be in that position at 10 p.m. and at midnight it will be approximately 30 degrees further to the west (figure 3a). A few months later Orion will have disappeared below the horizon and other constellations will have taken its place in the southern sky. So the appearance of the night sky changes slowly, until exactly one year later the Earth has reached the same point in its orbit again and on the first day of January Orion will be back in its original position at midnight.

The points where the extension of the Earth's axis cuts the celestial sphere are called the celestial Poles (see figure 4). Very close to the celestial North Pole is a star of average brightness, *Polaris*, or the Pole Star. It always appears in the same place in the sky, above the north point of the horizon, and the whole sky appears to be rotating around it. Looking at north in January at midnight, the Big Dipper appears east (to the right) of Polaris (figure 3b). Three months later, at the same time, it will be 'above' Polaris. You have to look way up high to see it. In another three months it will be west of Polaris and in October it will be close to the horizon. At least, this is the case if you are living north of latitude 40°N. The angle between the horizon plane and Polaris equals your latitude on earth. If you are living at 40° northern latitude, Polaris is 40 degrees above the northern horizon. When you are living closer to the Earth's equator Polaris will be closer to the horizon and the Big Dipper will, at its lowest position, disappear below the horizon. Looking south again, it will be the other way around. The closer to the equator you are, the higher the southern constellations rise above the horizon. Standing on the North Pole, you would see Polaris at 90 degrees above the horizon, actually in

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Figure 3a

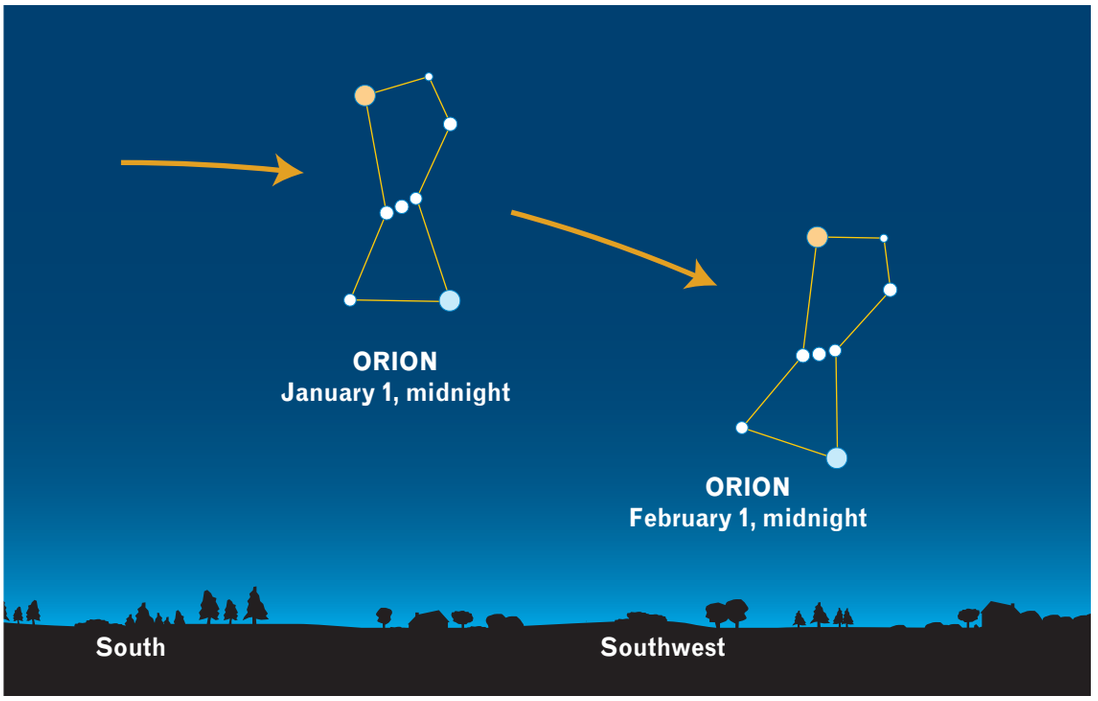
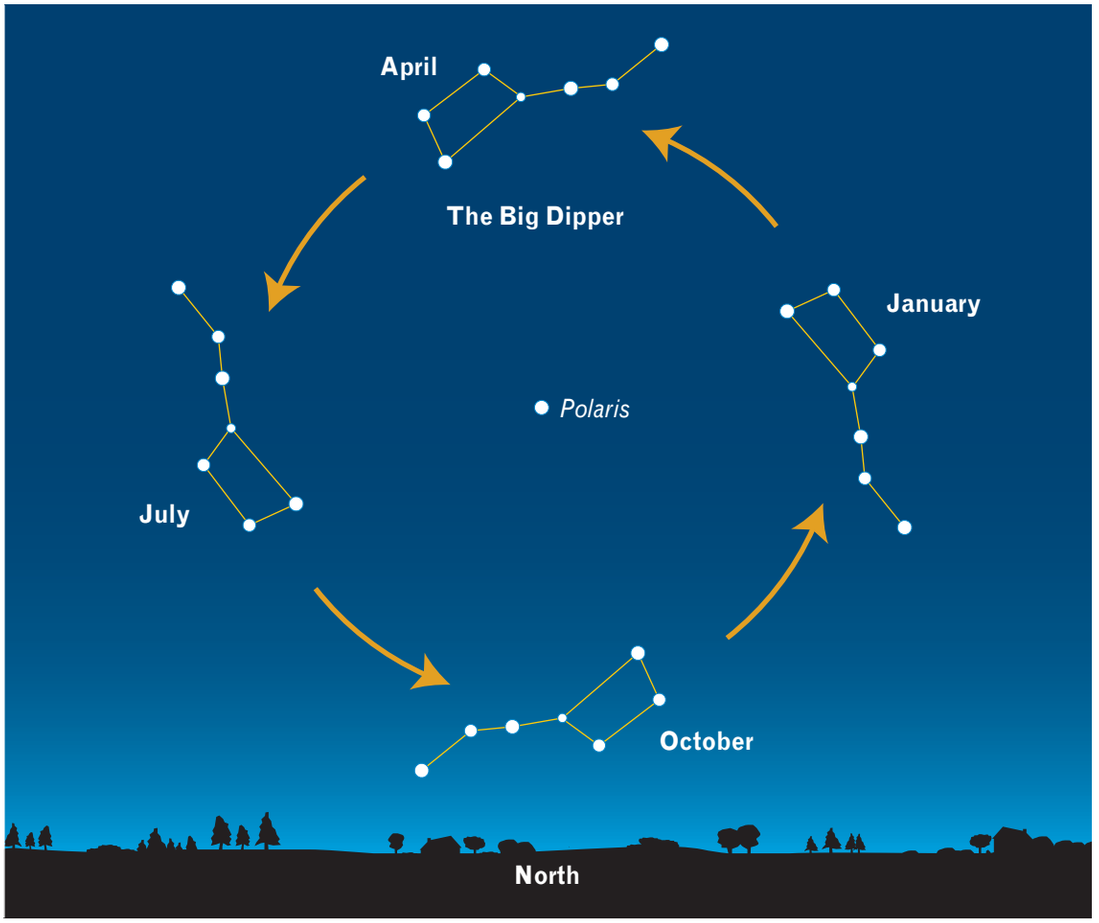


Figure 3b



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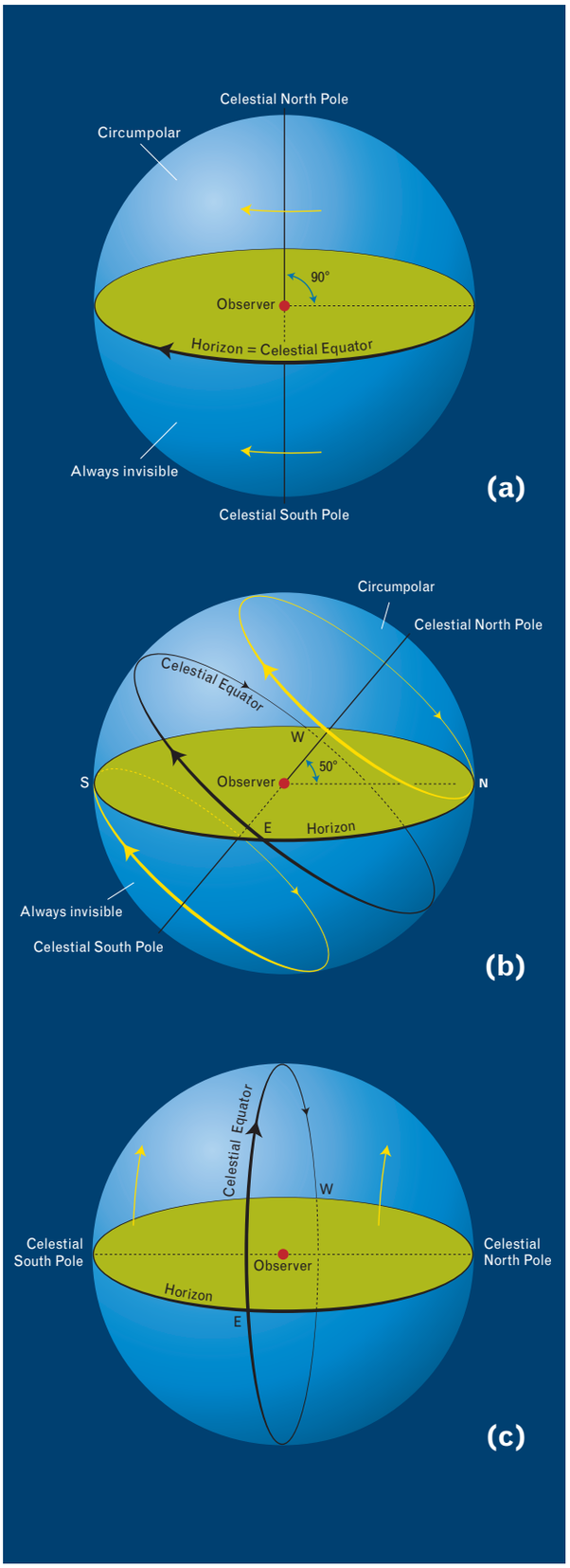

the *zenith*, the point straight above your head. From that cold location you would always see the same part of the sky, the northern half of the celestial sphere. Seen from there the whole sky rotates around the zenith, and stars move only parallel to the horizon – they do not rise or set (figure 4a). At the South Pole you have a similar situation, but with only the southern part of the sky visible. Since the axis of our planet does not change its position relative to the stars when it moves around the Sun, the sky visible from the poles of the Earth remains the same all year long or, better, during about six months of darkness. The rest of the year the poles have continuous daylight.

On the other hand, on the Equator things are quite different. The *celestial Equator*, the line where the plane of the Earth's Equator cuts the celestial sphere, runs from the east, passing directly overhead, to the west (figure 4c). All the stars and other objects in the sky rise and set, and during the course of a year it is possible to view the entire celestial sphere. Finally, in the intermediate areas the situation is more complicated, as you can see in the figure 4b. There is an area of the sky that is called *circumpolar.* Stars in this part of the sky are so close to the pole that they never rise or set, but remain above the horizon. In the opposite part of the celestial sphere, there is an equally sized part that never becomes visible.

In the star maps you can see a band of a slightly lighter blue, representing the brightest parts of the Milky Way. All the stars, nebulae and clusters that we see in the sky (except the galaxies; see pages 36–37, where nebulae and clusters are also explained in more detail) belong to a huge formation called the

Figure 4

(a) The way the sky moves for an observer at the North Pole. Half of the sky is always visible (circumpolar), and the other half is always invisible. Stars do not rise or set.

(b) The way the sky moves for an observer at a latitude of 50° north. A smaller part of the northern sky is always visible (circumpolar), and a similar area of the southern sky is always invisible. Most stars rise and set.

(c) The way the sky moves for an observer at the Equator. There are no circumpolar stars, and no stars that are always invisible. All stars rise and set.

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Milky Way Galaxy. Since our Milky Way Galaxy is a large, flat disk-like formation, we see most stars when we look along the plane of the Milky Way. All the light of the millions of stars that we do not see with the naked eye forms a cloud-like band that is easily visible when you are outside big cities and away from light-polluted areas.

The eight seasonal sky maps are constructed on a stereographic projection. Although this projection has the disadvantage that the scale increases from the center outward, its main advantage is that the shapes of the constellations and star groups are not distorted, making it easier to regognize them. When looking at the sky, there is a strange phenomenon, called the *Moon illusion*, which makes objects appear larger when close to the horizon than when they are high in the sky. This is, however, only a trick of the mind. We believe objects near the horizon to be at a greater distance than objects directly above our heads. The stereographic projection is in a way in harmony with this: constellations near the horizon appear larger!

Choosing the right map

There are eight 'seasonal' maps, two for each season, placed side-by-side on facing pages. The maps on the left-hand pages are for observers in the northern hemisphere and those on the right-hand pages are for southern observers.

Each map has four different horizons, labeled to show you the latitudes on Earth for which the horizon is exact. Depending on the latitude on Earth at which you are living, you can select your correct horizon. A few degrees more or less will not make too much difference, when you are looking at the sky.

The first map, A, is for January 15, at 10 p.m., the next, B, is for April 15, also at 10 p.m. Map C is for July and D for October, again at 10 p.m. You will notice that the *winter* map for northern observers is coupled with the *summer* map for southern observers. This is because when it is winter in the northern hemisphere of the Earth, it is summer 'down under'.

The maps can be used on other dates and times as well, as is shown in table A. Let's say you want to look at the sky in the middle of January, not in the evening, but later in the night. The table tells you that around 4 a.m. you can use map B. Keep in mind that one hour of time difference does not change the sky completely. As already said, during the night the stars move slowly from east to west along the sky, so in practice map B can be used without any problems from let's say 3 a.m. to 5 a.m. For your convenience the local time is also given for DST (Daylight Saving Time).

Another help for finding the right map is the band at the bottom of each chart. Here you see a number of months in the first row, and below that two time lines, one for regular time and one for DST. Above that you also see a key to the magnitudes. The word *magnitude* refers to the brightness of a star and is further explained in the introduction to the star charts, on page 31.

	Local Time	5 p.m.	6 p.m.	7 p.m.	8 p.m.	9 p.m.	10 p.m.	11 p.m.	Midnight	1 a.m.	2 a.m.	3 a.m.	4 a.m.	5 a.m.	6 a.m.	7 a.m.
	DST	6	7	8	9	10	11	M	1	2	3	4	5	6	7	8
January	1	D						A						B		
January	15						A						B			
February	1					A						B				
February	15				A						B					
March	1			A						B						C
March	15		A						B						C	
April	1	A						B						C		
April	15						B						C			
May	1					B						C				
May	15				B						C					
June	1			B						C						D
June	15		B						C						D	
July	1	B						C						D		
July	15						C						D			
August	1					C						D				
August	15				C						D					
September	1			C						D						A
September	15		C						D						A	
October	1	C						D						A		
October	15						D						A			
November	1					D						A				
November	15				D						A					
December	1			D						A						B
December	15		D						A						B	

Table A *Seasonal sky maps*

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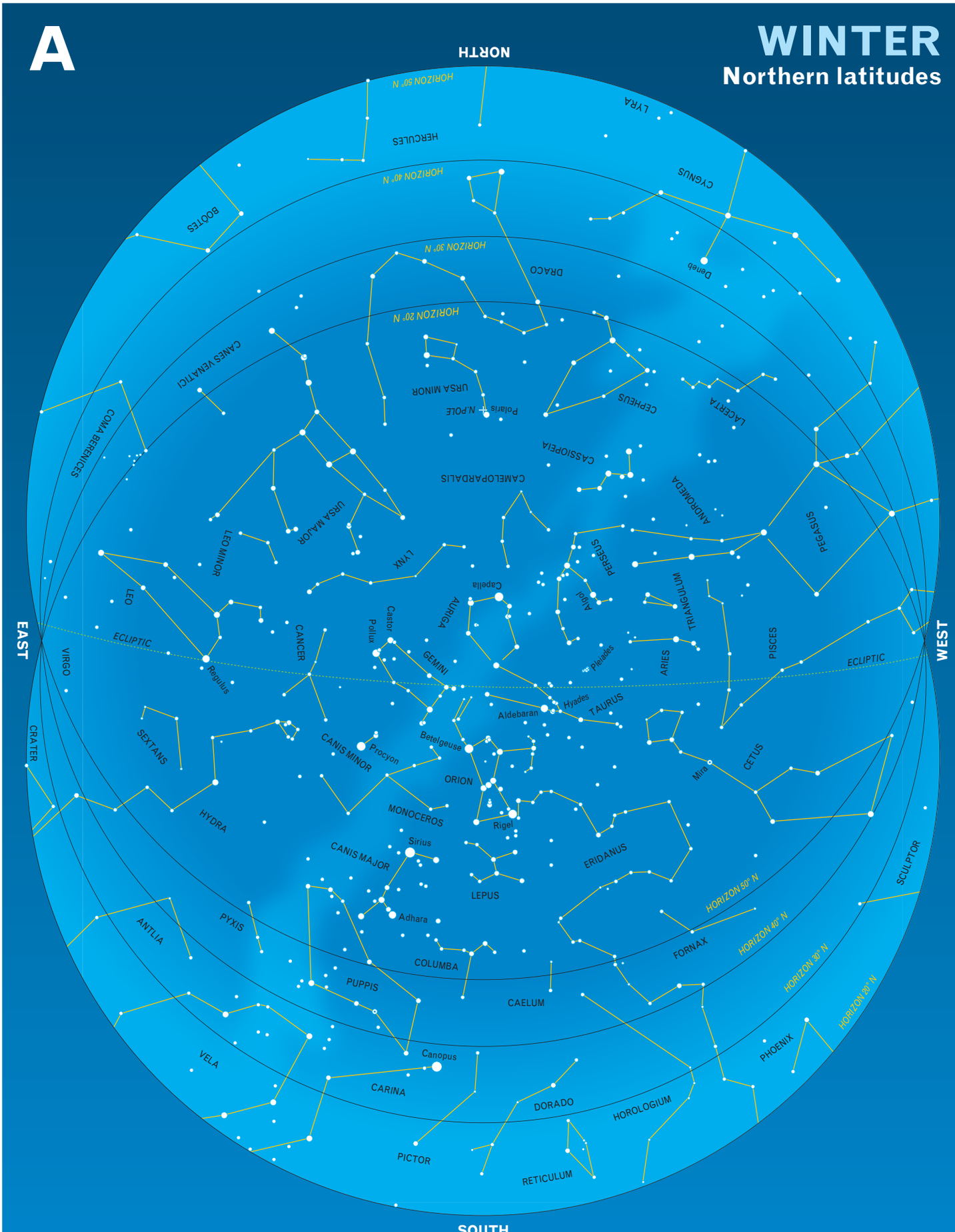
A

WINTER
Northern latitudes



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	OCTOBER		NOVEMBER		DECEMBER	**JANUARY**			FEBRUARY
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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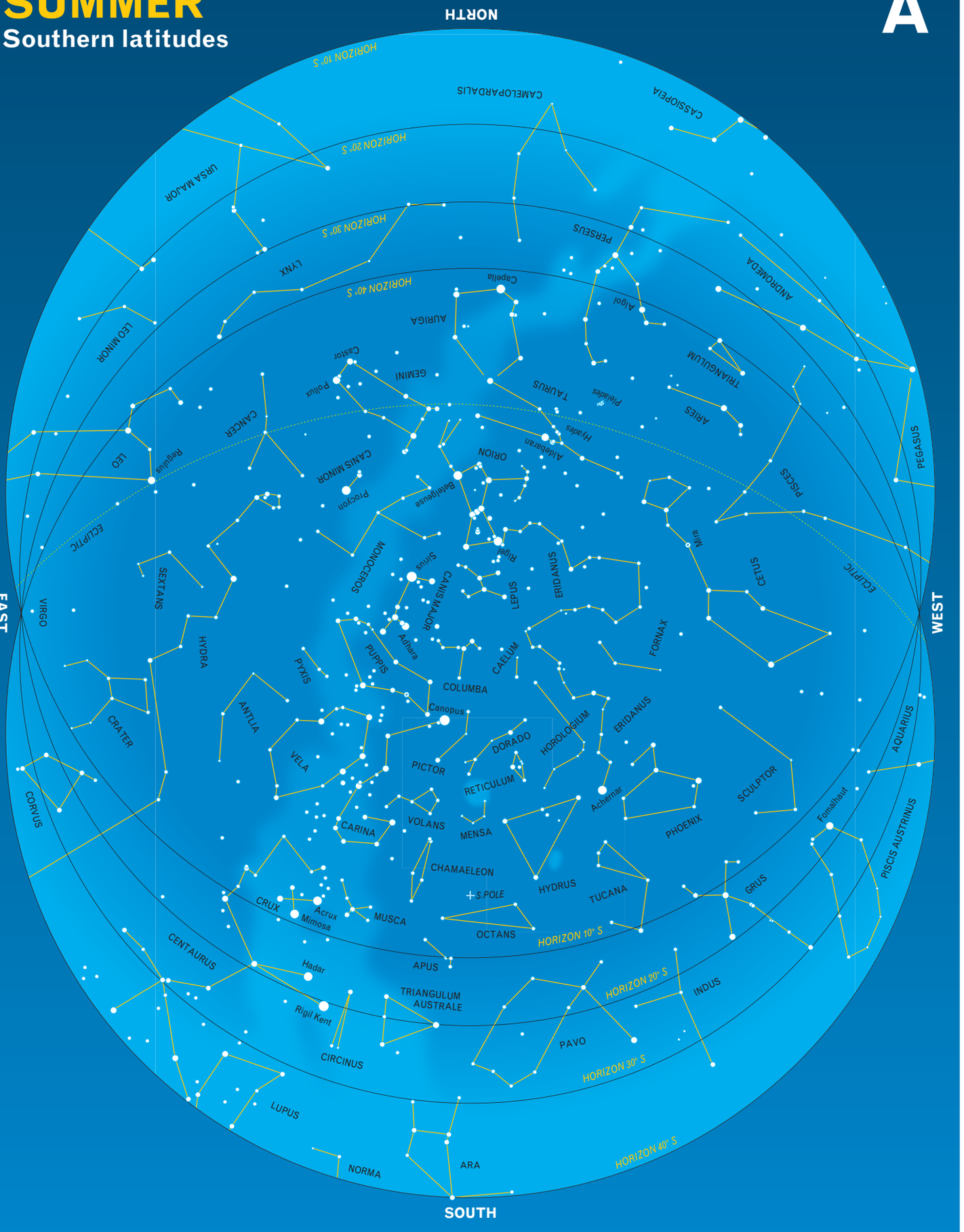
SUMMER
Southern latitudes

A



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	OCTOBER		NOVEMBER		DECEMBER	**JANUARY**			FEBRUARY
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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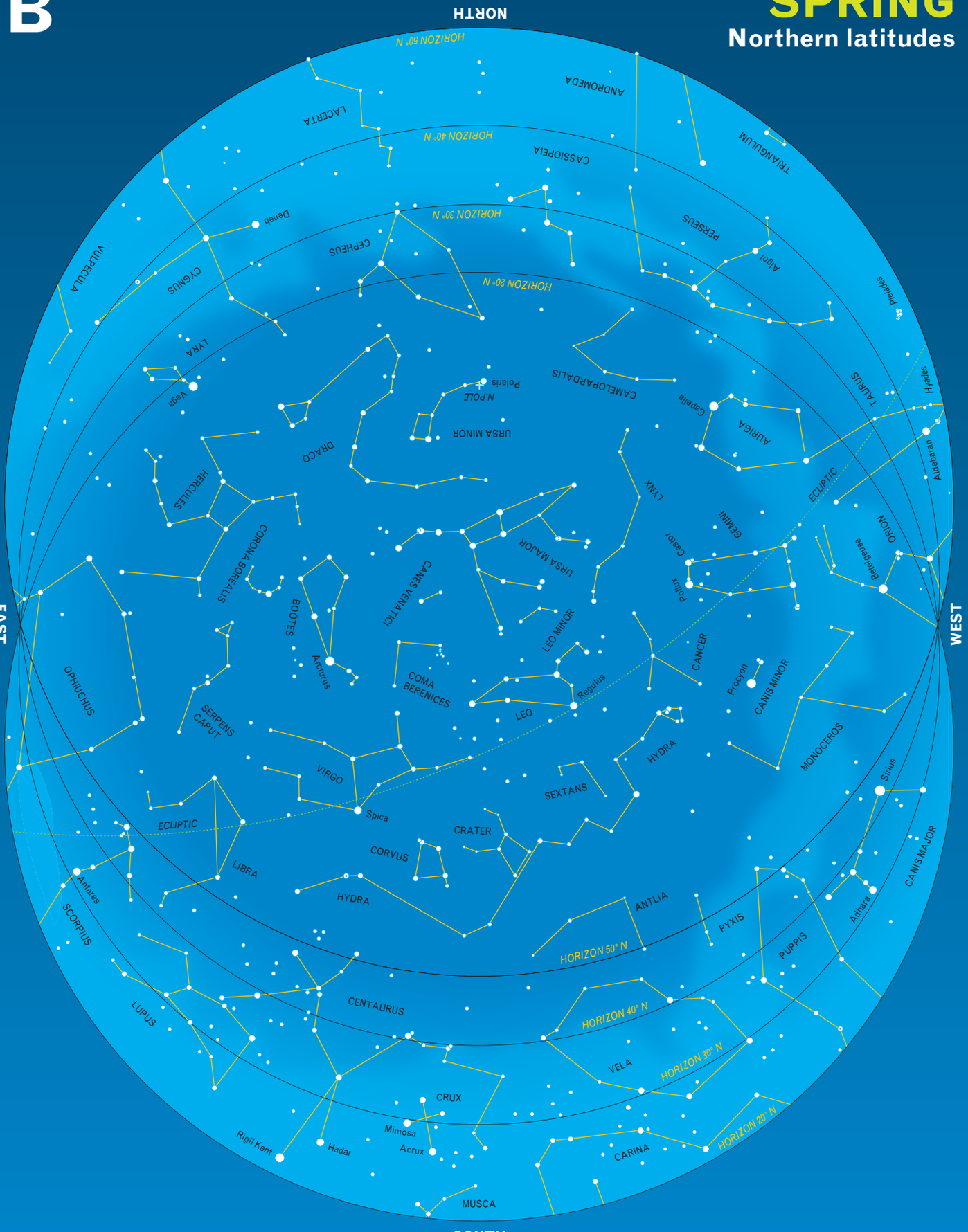
B

SPRING
Northern latitudes



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	JANUARY		FEBRUARY		MARCH	**APRIL**			MAY
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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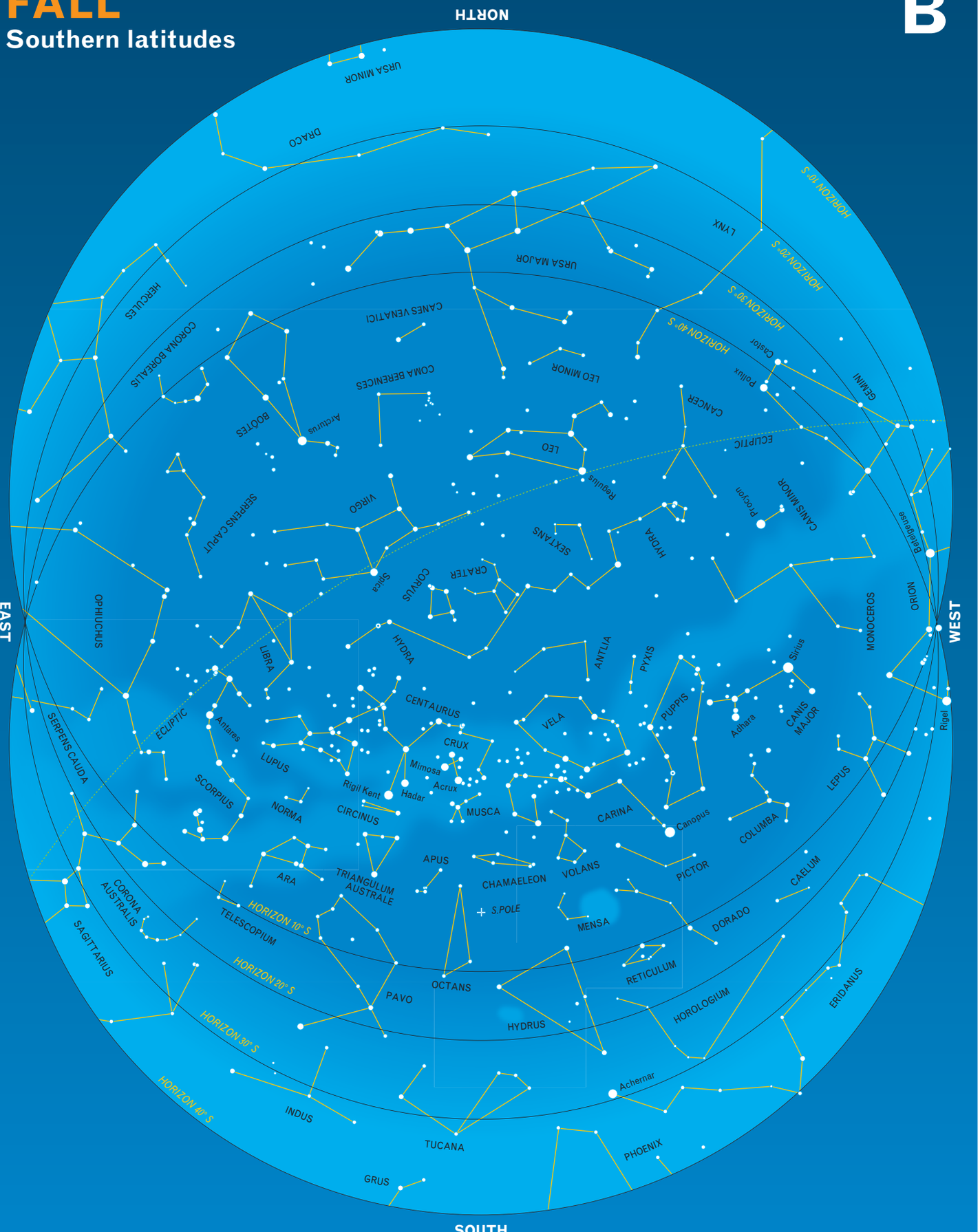
FALL
Southern latitudes

B



Magnitudes: ● –1 ● 0 ● 1 ● 2 • 3 • 4 · 5

Date	JANUARY		FEBRUARY		MARCH	**APRIL**			MAY
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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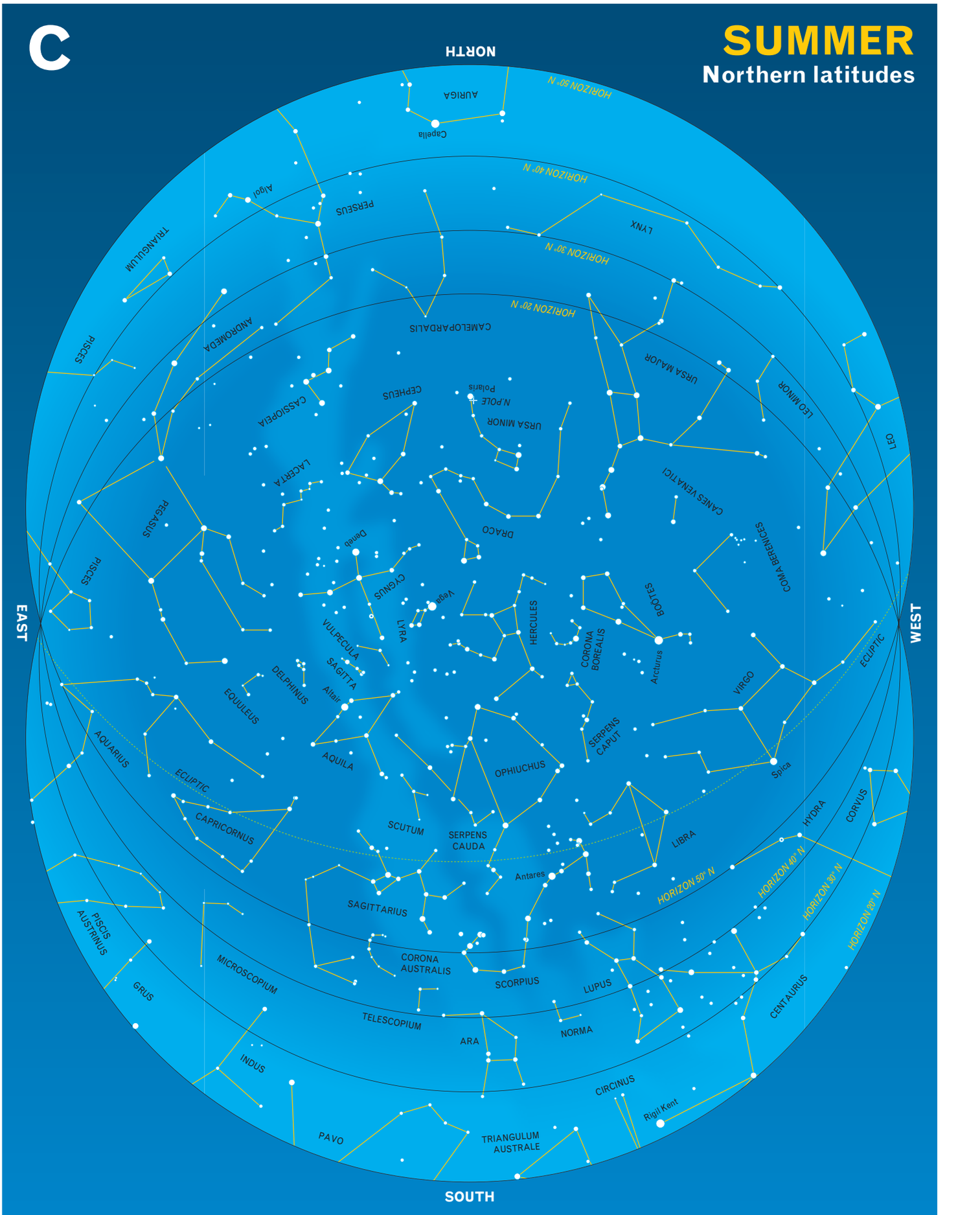
C

SUMMER
Northern latitudes



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	APRIL		MAY		JUNE	**JULY**		AUGUST
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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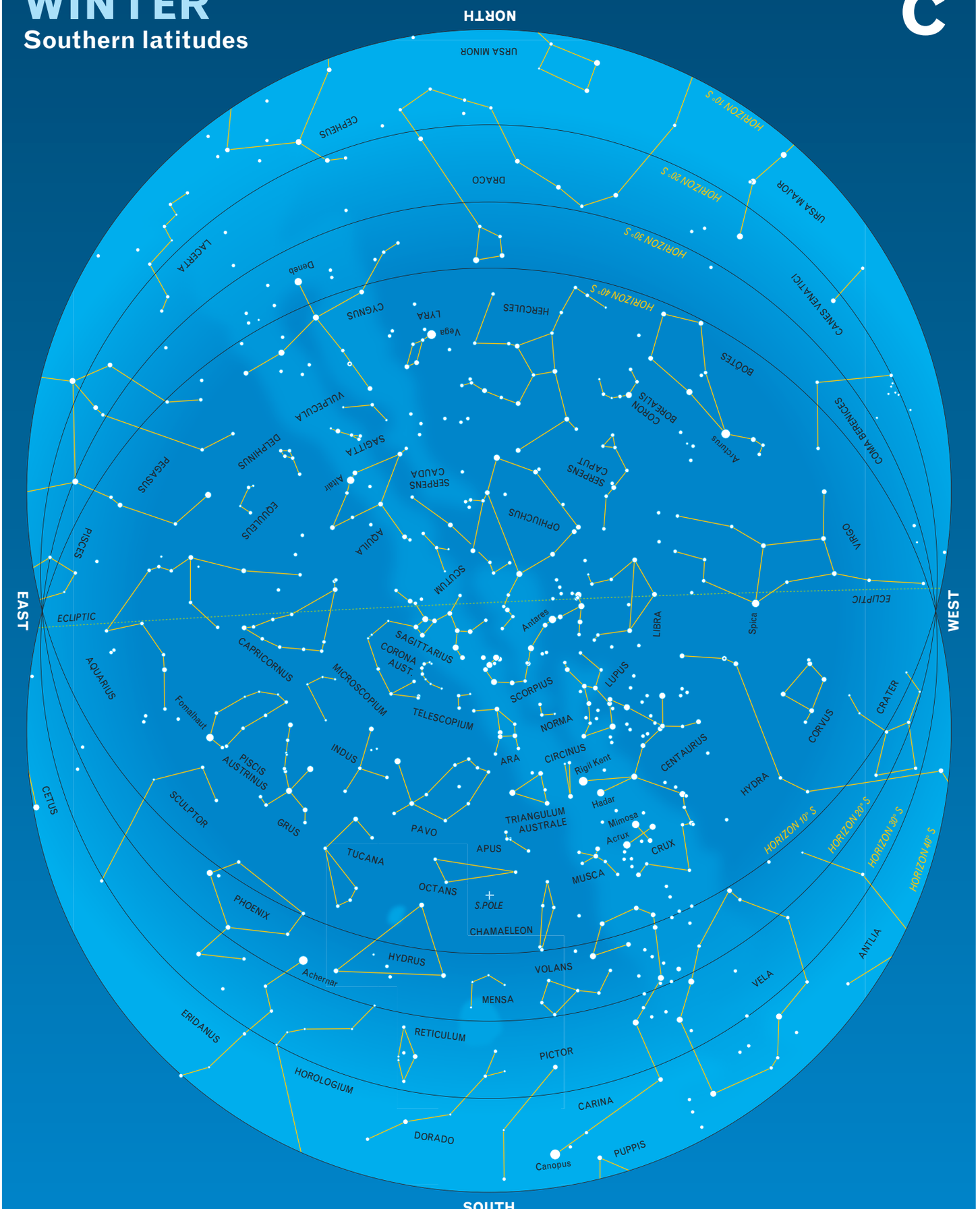
WINTER
Southern latitudes

C



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	APRIL		MAY		JUNE	**JULY**			AUGUST
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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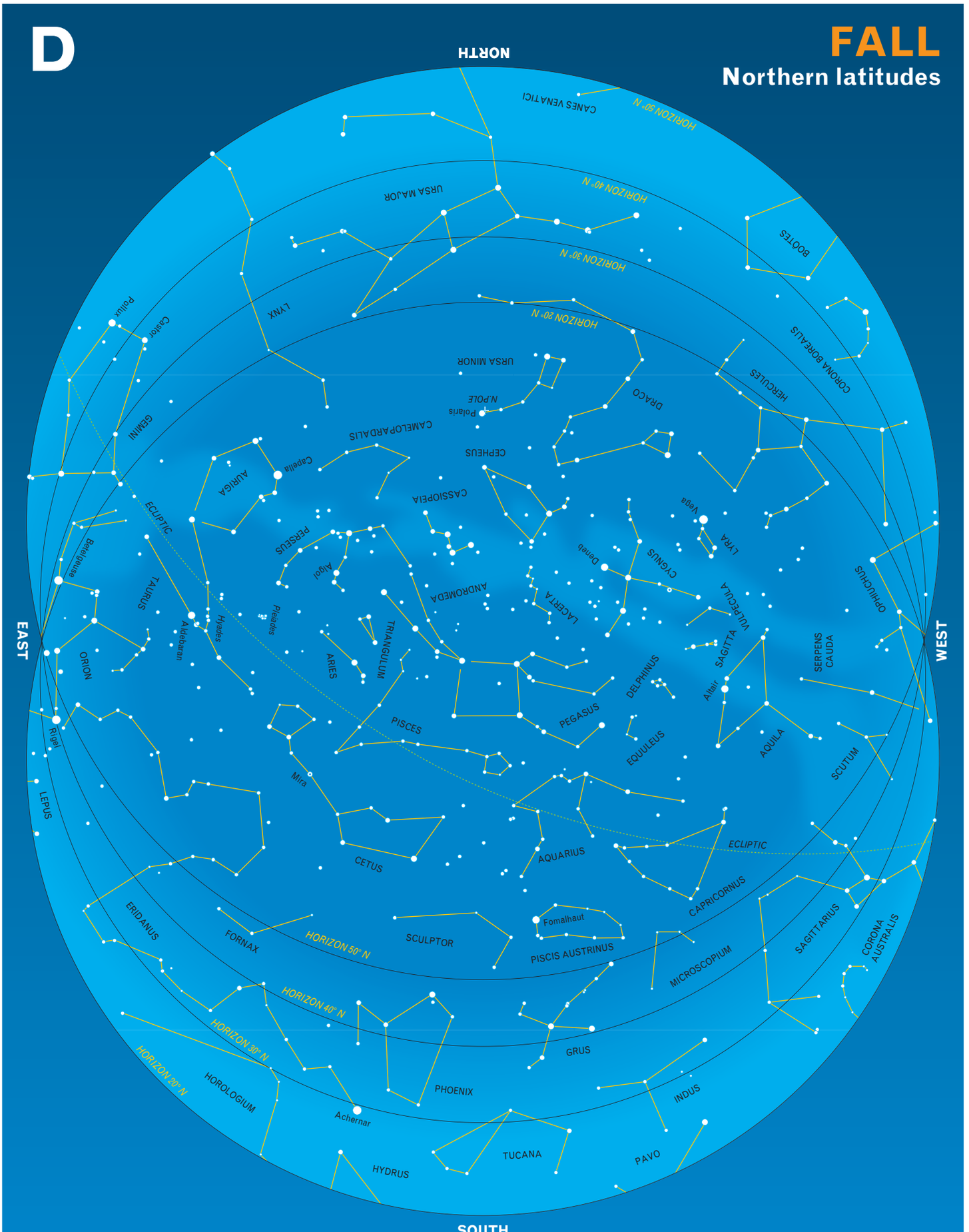
D

FALL
Northern latitudes



Magnitudes: ● –1 ● 0 ● 1 ● 2 ● 3 ● 4 · 5

Date	JULY		AUGUST		SEPTEMBER	**OCTOBER**			NOVEMBER
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
DST	*5 a.m.*	*4 a.m.*	*3 a.m.*	*2 a.m.*	*1 a.m.*	*Midnight*	*11 p.m.*	*10 p.m.*	*9 p.m.*

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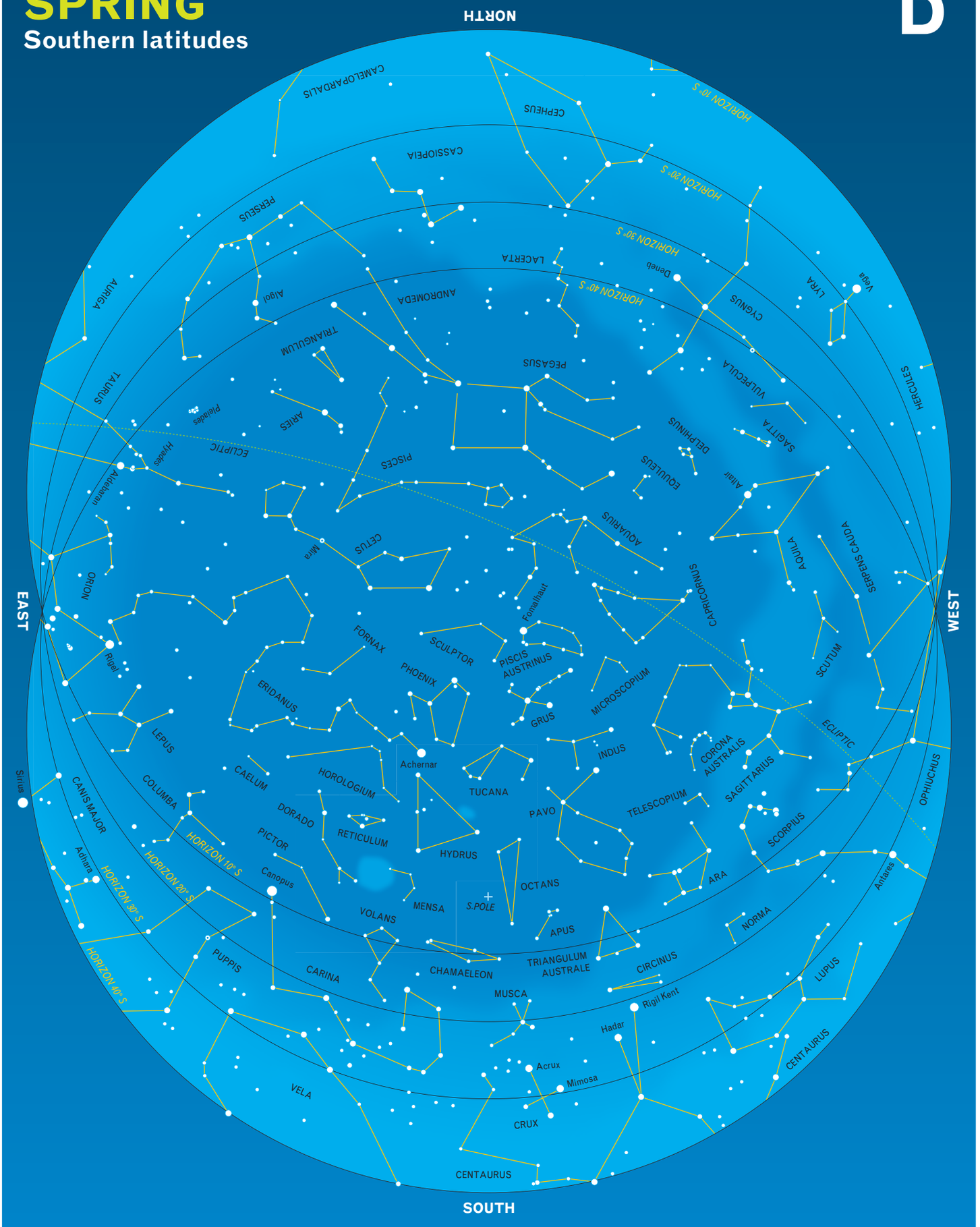
SPRING
Southern latitudes

D



Magnitudes: –1 0 1 2 3 4 5

Date	JULY		AUGUST		SEPTEMBER	OCTOBER		NOVEMBER
Time	4 a.m.	3 a.m.	2 a.m.	1 a.m.	Midnight	**11 p.m.**	**10 p.m.**	**9 p.m.**	8 p.m.
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THE MOON

The Moon is, apart from the Sun, the brightest object in the sky. Although the Sun and the Moon appear almost equal in size, they are quite different. The Sun is the central body of our Solar System, and all planets, including the Earth, orbit around it. The Sun measures 1.4 million kilometers across, and lies at a distance of roughly 150,000,000 kilometers. The Moon is much smaller and measures 'only' 3,476 kilometers across; approximately one quarter of the Earth's diameter. The Moon lies at an average distance of 384,400 kilometers from the Earth. It orbits, not the Sun, but our own planet, in a little more than 27 days.

Although we often refer to the Moon as 'shining' it does not of itself give any light. It only reflects the light it receives from the Sun. This is the reason why the appearance of the Moon changes as it orbits the Earth. This aspect of the Moon, sometimes visible as a thin crescent in the western sky, after sunset, and sometimes as a full disk, lightening up the middle of the night, is confusing to many people. The reason for this can be best explained in a diagram (figure 1).

The illustration is not drawn to scale, but shows you what happens. The Earth is at the center and the Moon's orbit is drawn as a circle. During its orbit around the Earth we see a different portion of the illuminated side of the Moon's surface. (In the figure the red arrows indicate our line of sight from the Earth.)

When the Moon is approximately between the Sun and the Earth, we see only its dark side. We call this a new Moon. The Moon is not visible at all. After one or two days we see a small crescent in the evening sky; a part of the illuminated side is peeping around the edge. After almost a week, half of the disk is lit and we call this the first quarter. Another week later we see the complete disk. This is a full Moon. Next comes the last quarter, and then back to new Moon again. From one new Moon to the next takes about 29.5 days, fully two days longer than it takes the Moon to orbit the Earth. The reason for this is that, in the time the Moon revolves around

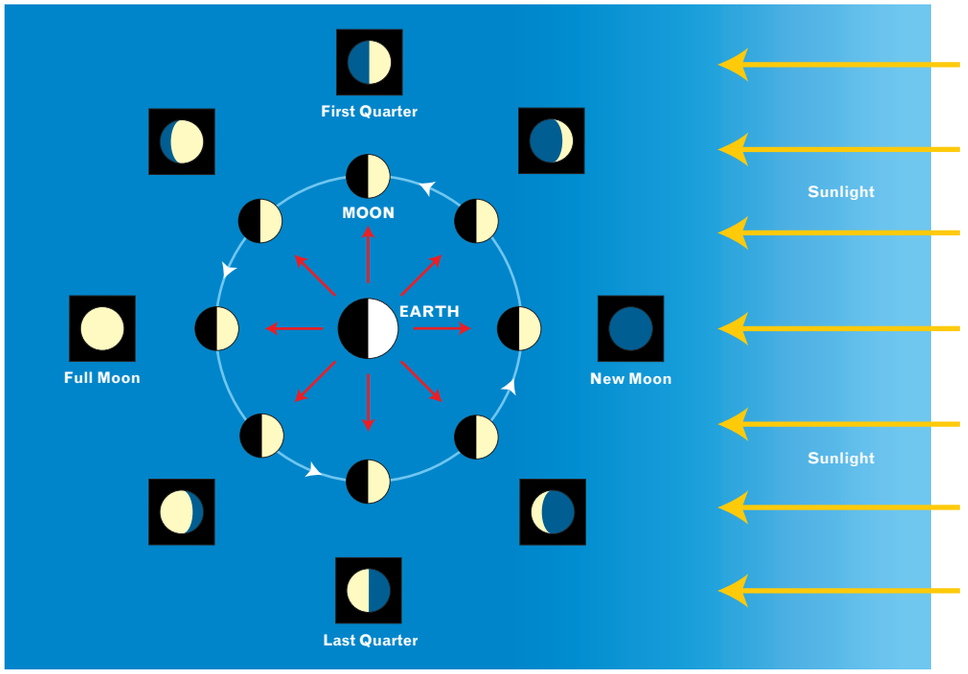

Figure 1

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the Earth, the Earth also moves in its orbit around the Sun. In the 27 days it takes the Moon to orbit the Earth, the Sun's position in the sky also changes, moving in the same direction the Moon moves. It takes the Moon more than two days to 'catch up' with the Sun.

Observing the Moon

Even with a simple pair of binoculars you can see interesting features on the Moon's surface, and a small telescope will reveal even more details of our neighbor in space. The best time to watch the Moon is not when it is full, but rather around its first or last quarter. Then the Moon is illuminated by the Sun from one side and especially near the terminator, the line dividing the lit and the unlit halves of the Moon, there is strong relief, because the surface is illuminated from a very low angle, resulting in long shadows. At full Moon you do not see any relief, since you are then looking from approximately the same direction as the Sun's rays come from. But full Moon is an ideal time to study the differences between the dark and light areas of the surface.

On the Moon maps (on pages 4–5 and 6–7), you can identify the craters and other small features, by referring to the numbers in the list alongside the maps. To help you see which crater a number is referring to, a small black dot is placed in its center. On the first double-page Moon map (map A) the features are listed in numerical order, and for your convenience they are repeated in alphabetical order on the second spread, with the mirror-reversed map (map B). The reason the Moon is shown in two different ways is explained below and on page 3.

Larger features, like mountain ranges and the darker areas called *maria,* are labeled directly on the map. *Maria* is the plural form of the Latin word *mare*, meaning sea. The first observers who believed that these dark areas on the Moon really were seas gave the name. Although we now know there are no seas on the Moon, the name persists, as also do the names *lacus* (lake) and *oceanus* (ocean).

Most craters on the Moon are believed to be the result of the impact of meteors: pieces of rock and metal from space. The Earth is well protected against the impact of meteors by the atmosphere, which causes meteors to burn and vaporize. We call that a 'falling star' or 'shooting star', though it is not a star at all. Only fragments of large meteors reach the surface; we call these fragments meteorites. But the Moon does not have an atmosphere, so every meteor captured by the Moon's gravity will crash into the surface.

Because the Moon rotates 360° on its axis in exactly the same time that it takes to complete one orbit around the Earth, we always see the same side of the Moon. However the Moon's orbit is inclined about 5° to the *ecliptic* (page 37), making it move slightly above and below the plane of the Earth's orbit around the Sun, and the Moon's own spin axis is also tilted about 1.5°. The combined result is that we can occasionally see about 6.5° 'over' the North and South Poles of the Moon. Moreover, since the Moon's orbit is not really a circle, but an ellipse, it does not move at a constant speed, though its rotation speed remains the same. Thus, as seen from the Earth, it moves a little from left to right, as if it were shaking its head very slowly. Therefore, we can look around the edges, by up to 7°. Sometimes Mare Crisium (in the northeastern quadrant of the Moon) appears very close to the edge, and sometimes it is closer to the center, and has a less elliptical appearance. The elliptical appearance of Mare Crisium, as well as those of craters close to the visible edge, is of course caused by perspective.

Different orientations of the Moon

Naked-eye observers living in the northern hemisphere see the Moon with north up and south down. That is also the way they will see it in a pair of binoculars. However, using an astronomical telescope will usually show the Moon 'upside down'. That is why map A, on pages 4–5, shows the Moon with south at the top, so that will be practical for most observers using a telescope. For naked-eye or binocular observations the map has to be held upside down.

When you are living in the southern hemisphere, it will be the other way around. The map can be used directly for naked-eye and binocular observations, but when you use a telescope, you have to rotate

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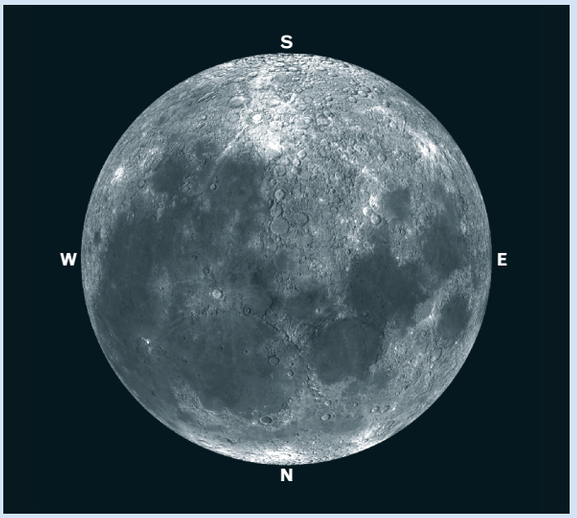
it. To make things even more complicated, many observers use a telescope with a *star diagonal;* an eyepiece with a diagonal mirror or a prism. That makes observing more comfortable, but it inverts or 'flips' the image. Those observers have to use Moon map B, on pages 6–7. Here the whole image of the Moon is mirror-reversed.

In figure 2 you can see the four different orientations of the Moon with captions telling you when and where to use each map.

Figure 2

Moon Map A (pages 4–5)
Northern hemisphere:
For observers with an astronomical telescope.
Southern hemisphere:
For observing with the naked eye and with binoculars.

Moon Map A (pages 4–5), rotated
Northern hemisphere:
For observing with the naked eye and with binoculars.
Southern hemisphere:
For observers with an astronomical telescope.



Moon Map B (pages 6–7)
Southern hemisphere:
For observers using an astronomical telescope with star diagonal.

Moon Map B (pages 6–7), rotated
Northern hemisphere:
For observers using an astronomical telescope with star diagonal.

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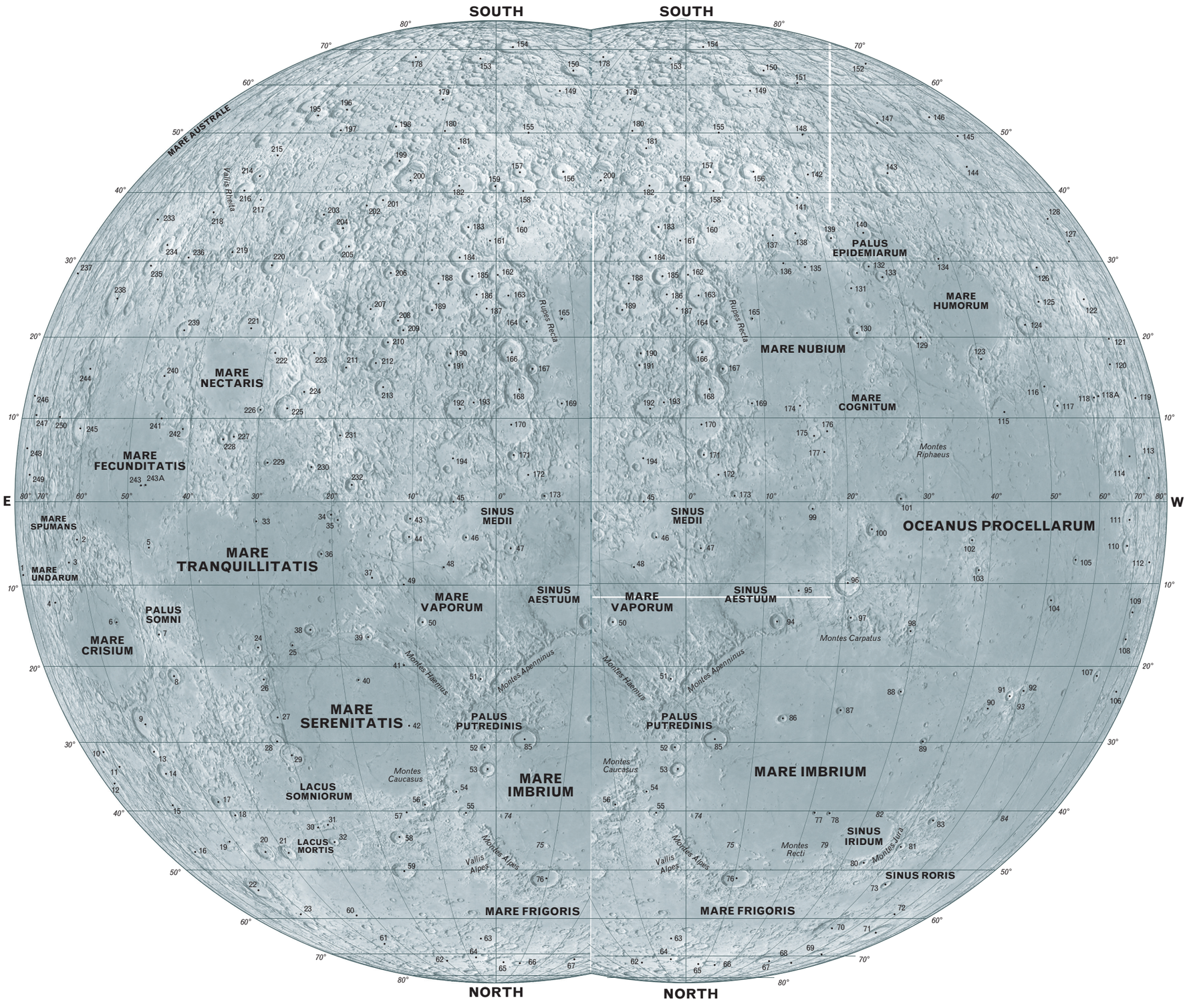
Moon Map A

Features in numerical order

1 Neper
2 Apollonius
3 Firmicus
4 Condorcet
5 Taruntius
6 Picard
7 Proclus
8 Macrobius
9 Cleomedes
10 Hahn
11 Berosus
12 Gauss
13 Burckhardt
14 Geminus
15 Messala
16 Mercurius
17 Franklin
18 Cepheus
19 Chevallier
20 Atlas
21 Hercules
22 Endymion
23 de la Rue
24 Vetruvius
25 Dawes
26 Littrow
27 Le Monnier
28 Chacornac
29 Posidonius
30 Mason
31 Plana
32 Bürg
33 Maskelyne
34 Sabine
35 Ritter
36 Arago
37 Julius Caesar
38 Plinius
39 Menelaus
40 Bessel
41 Sulpicius Gallus
42 Linné
43 Godin
44 Agrippa
45 Rhaeticus
46 Triesnecker
47 Pallas
48 Hyginus
49 Boscovich
50 Manilius
51 Conon
52 Autolycus
53 Aristillus
54 Theaetetus
55 Cassini
56 Calippus
57 Alexander
58 Eudoxus
59 Aristoteles
60 Gärtner
61 Arnold
62 Meton
63 W. Bond
64 Barrow
65 Goldschmidt
66 Anaxagoras
67 Philolaus
68 Anaximenes
69 Carpenter
70 J. Herschel
71 Pythagoras
72 Babbage
73 Harpalus
74 Mons Piton
75 Mons Pico
76 Plato
77 Le Verrier
78 Helicon
79 Promontorium Laplace
80 Bianchini
81 Sharp
82 Promontorium Heraclides
83 Mairan
84 Mons Rümker
85 Archimedes
86 Timocharis
87 Lambert
88 Euler
89 Delisle
90 Prinz
91 Aristarchus
92 Herodotus
93 Vallis Schröteri
94 Eratosthenes
95 Stadius
96 Copernicus
97 Gay-Lussac
98 Mayer
99 Gambart
100 Reinhold
101 Lansberg
102 Encke
103 Kepler
104 Marius
105 Reiner
106 Struve
107 Seleucus
108 Krafft
109 Cardanus
110 Cavalerius
111 Hevelius
112 Olbers
113 Riccioli
114 Grimaldi
115 Letronne
116 Billy
117 Hansteen
118 Sirsalis & Sirsalis A
119 Rocca
120 Crüger
121 Darwin
122 Byrgius
123 Gassendi



Moon Map A

Features in numerical order

124 Mersenius
125 Cavendish
126 Vieta
127 Lagrange
128 Piazzi
129 Agatharchides
130 Bullialdus
131 Kies
132 Mercator
133 Campanus
134 Vitello
135 Hesiodus
136 Pitatus
137 Gauricus
138 Wurzelbauer
139 Cichus
140 Capuanus
141 Heinsius
142 Wilhelm
143 Mee
144 Schickard
145 Wargentin
146 Phocylides
147 Schiller
148 Longomontanus
149 Clavius
150 Blancanus
151 Scheiner
152 Bailly
153 Curtius
154 Moretus
155 Maginus
156 Tycho
157 Saussure
158 Orontius
159 Nasireddin
160 Lexell
161 Walter
162 Regiomontanus
163 Purbach
164 Thebit
165 Birt
166 Arzachel
167 Alpetragius
168 Alphonsus
169 Davy
170 Ptolemaeus
171 Herschel
172 Flammarion
173 Mösting
174 Guericke
175 Parry
176 Bonpland
177 Fra Mauro
178 Manzinus
179 Jacobi
180 Cuvier
181 Licetus
182 Stöfler
183 Nonius
184 Aliacensis
185 Werner
186 Blanchinus
187 La Caille
188 Apianus
189 Playfair
190 Airy
191 Argelander
192 Albategnius
193 Klein
194 Hipparchus
195 Vlacq
196 Hommel
197 Pitiscus
198 Baco
199 Barocius
200 Maurolycus
201 Buch
202 Büsching
203 Riccius
204 Rabbi Levi
205 Zagut
206 Pontanus
207 Sacrobosco
208 Azophi
209 Abenezra
210 Geber
211 Tacitus
212 Almanon
213 Abulfeda
214 Fabricius
215 Janssen
216 Metius
217 Brenner
218 Rheita
219 Neander
220 Piccolomini
221 Fracastorius
222 Beaumont
223 Catharina
224 Cyrillus
225 Theophilus
226 Mädler
227 Isidorus
228 Capella
229 Torricelli
230 Hypatia
231 Zöllner
232 Delambre
233 Furnerius
234 Stevinus
235 Snellius
236 Reichenbach
237 Humboldt
238 Petavius
239 Santbech
240 Colombo
241 Goclenius
242 Gutenberg
243 Messier & Messier A
244 Vendelinus
245 Langrenus
246 Ansgarius
247 La Pérouse
248 Kästner
249 Gilbert
250 Kapteyn

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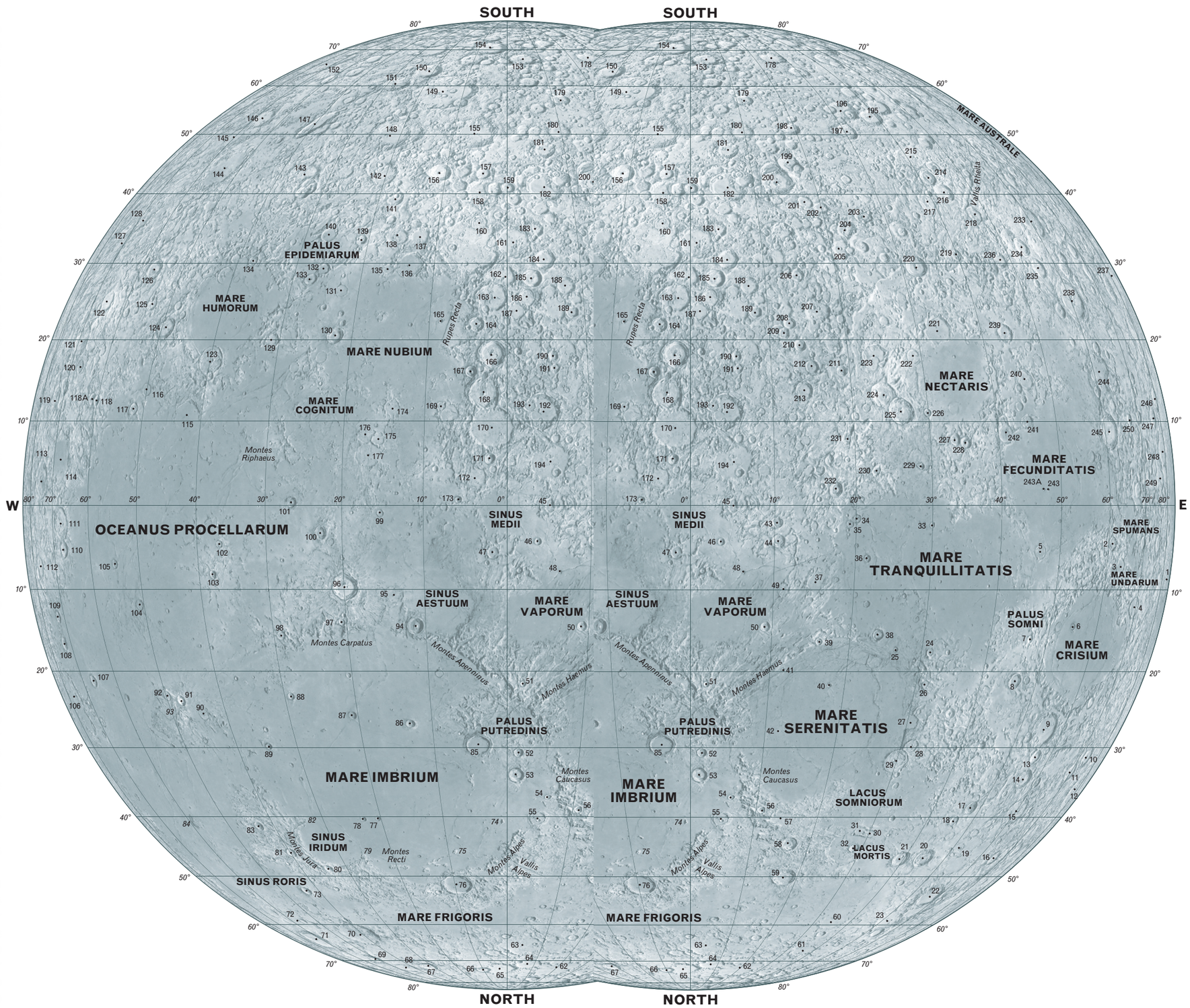
Moon Map B

Mirror reversed image

Features in alphabetical order

Abenezra	209	Cleomedes	9
Abulfeda	213	Colombo	240
Agatharchides	129	Condorcet	4
Agrippa	44	Conon	51
Airy	190	Copernicus	96
Albategnius	192	Crüger	120
Alexander	57	Curtius	153
Aliacensis	184	Cuvier	180
Almanon	212	Cyrillus	224
Alpetragius	167	Darwin	121
Alphonsus	168	Davy	169
Anaxagoras	66	Dawes	25
Anaximenes	68	de la Rue	23
Ansgarius	246	Delambre	232
Apianus	188	Delisle	89
Apollonius	2	Encke	102
Arago	36	Endymion	22
Archimedes	85	Eratosthenes	94
Argelander	191	Eudoxus	58
Aristarchus	91	Euler	88
Aristillus	53	Fabricius	214
Aristoteles	59	Firmicus	3
Arnold	61	Flammarion	172
Arzachel	166	Fra Mauro	177
Atlas	20	Fracastorius	221
Autolycus	52	Franklin	17
Azophi	208	Furnerius	233
Babbage	72	Gambart	99
Baco	198	Gärtner	60
Bailly	152	Gassendi	123
Barocius	199	Gauricus	137
Barrow	64	Gauss	12
Beaumont	222	Gay-Lussac	97
Berosus	11	Geber	210
Bessel	40	Geminus	14
Bianchini	80	Gilbert	249
Billy	116	Goclenius	241
Birt	165	Godin	43
Blancanus	150	Goldschmidt	65
Blanchinus	186	Grimaldi	114
Bonpland	176	Guericke	174
Boscovich	49	Gutenberg	242
Brenner	217	Hahn	10
Buch	201	Hansteen	117
Bullialdus	130	Harpalus	73
Burckhardt	13	Heinsius	141
Bürg	32	Helicon	78
Büsching	202	Hercules	21
Byrgius	122	Herodotus	92
Calippus	56	Herschel	171
Campanus	133	Hesiodus	135
Capella	228	Hevelius	111
Capuanus	140	Hipparchus	194
Cardanus	109	Hommel	196
Carpenter	69	Humboldt	237
Cassini	55	Hyginus	48
Catharina	223	Hypatia	230
Cavalerius	110	Isidorus	227
Cavendish	125	J. Herschel	70
Cepheus	18	Jacobi	179
Chacornac	28	Janssen	215
Chevallier	19	Julius Caesar	37
Cichus	139	Kapteyn	250
Clavius	149	Kästner	248



Kepler	103	Plinius	38
Kies	131	Pontanus	206
Klein	193	Posidonius	29
Krafft	108	Prinz	90
La Caille	187	Proclus	7
La Pérouse	247	*Promontorium Heraclides*	82
Lagrange	127	*Promontorium Laplace*	79
Lambert	87	Ptolemaeus	170
Langrenus	245	Purbach	163
Lansberg	101	Pythagoras	71
Le Monnier	27	Rabbi Levi	204
Le Verrier	77	Regiomontanus	162
Letronne	115	Reichenbach	236
Lexell	160	Reiner	105
Licetus	181	Reinhold	100
Linné	42	Rhaeticus	45
Littrow	26	Rheita	218
Longomontanus	148	Riccioli	113
Macrobius	8	Riccius	203
Mädler	226	Ritter	35
Maginus	155	Rocca	119
Mairan	83	Sabine	34
Manilius	50	Sacrobosco	207
Manzinus	178	Santbech	239
Marius	104	Saussure	157
Maskelyne	33	Scheiner	151
Mason	30	Schickard	144
Maurolycus	200	Schiller	147
Mayer	98	Seleucus	107
Mee	143	Sharp	81
Menelaus	39	Sirsalis & Sirsalis A	118
Mercator	132	Snellius	235
Mercurius	16	Stadius	95
Mersenius	124	Stevinus	234
Messala	15	Stöfler	182
Messier & Messier A	243	Struve	106
Metius	216	Sulpicius Gallus	41
Meton	62	Tacitus	211
Mons Pico	75	Taruntius	5
Mons Piton	74	Theaetetus	54
Mons Rümker	84	Thebit	164
Moretus	154	Theophilus	225
Mösting	173	Timocharis	86
Nasireddin	159	Torricelli	229
Neander	219	Triesnecker	46
Neper	1	Tycho	156
Nonius	183	*Vallis Schröteri*	93
Olbers	112	Vendelinus	244
Orontius	158	Vetruvius	24
Pallas	47	Vieta	126
Parry	175	Vitello	134
Petavius	238	Vlacq	195
Philolaus	67	W. Bond	63
Phocylides	146	Walter	161
Piazzi	128	Wargentin	145
Picard	6	Werner	185
Piccolomini	220	Wilhelm	142
Pitatus	136	Wurzelbauer	138
Pitiscus	197	Zagut	205
Plana	31	Zöllner	231
Plato	76		
Playfair	189		

Moon Map B

Mirror reversed image

Features in alphabetical order

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THE MESSIER OBJECTS

The French astronomer *Charles Messier* (1730–1817) created a list of 103 *deep-sky objects* (star clusters, nebulae and galaxies) that was first published in 1774. Later, other astronomers added a few more objects and today the list contains 110 objects. In the charts on the following six pages and in the star charts on pages 40–79 these objects are labeled with the number from his list with the prefix M (like M42, M78, etc).

Messier was a 'comet hunter', and while scanning the sky from his observatory in Paris he frequently ran into faint objects that could be mistaken for comets. He compiled the list to help him distinguish between the real comets and these permanent objects. Although most of the objects in Messier's list were later included in larger catalogs of deep-sky objects, Messier's list remains immensely popular amongst amateur observers. That is why the charts on the following eight pages focus on these objects.

All Messier objects are clearly plotted on the charts, against a background showing all stars brighter than magnitude 5.5. The meaning of the word *magnitude* is explained on page 31. For the abbreviations used in the column head, you may refer to page 38. The symbols used for the different types of objects are the same as used in the main star charts.

The charts in this chapter also serve as an *index* to the star charts. The area covered by each chart (not including the overlap) is marked with lines in a lighter blue, and the number is clearly shown in a slightly darker color.

Table B provides you with information about all the Messier objects, and they can easily be identified on the four double-page charts (a, b, c and d) on pages 22–29. For your convenience, the chart numbers are listed in the final columns, together with the numbers of the main star charts, where they can be found (1, 2, 3, etc).

Table B *The Messier objects*

Messier number	NGC/IC	Con	RA h m	Dec ° ′	Mag	Size ′	Type *	Common name / note	Chart numbers Messier	Main
1	1952	Tau	05 34.5	+22 01	8.4	6 × 4	N	*Crab Nebula*	b	3 9
2	7089	Aqr	21 33.5	−00 49	6.5	12.9	GC		c	13
3	5272	CVn	13 42.2	+28 23	6.4	16.2	GC		a c	5
4	6121	Sco	16 23.6	−26 32	5.9	26.3	GC		c d	11 12 17 18
5	5904	Ser	15 18.6	+02 05	5.8	17.4	GC		c	11 12
6	6405	Sco	17 40.1	−32 13	4.2	15	OC	*Butterfly Cluster*	c d	18
7	6475	Sco	17 53.9	−34 49	3.3	80	OC	*Ptolemy's Cluster*	c d	18
8	6523	Sgr	18 03.8	−24 23	5.8	90 × 40	N	*Lagoon Nebula*	c	12 18
9	6333	Oph	17 19.2	−18 31	7.9	9.3	GC		c	12 18
10	6254	Oph	16 57.1	−04 06	6.6	15.1	GC		c	12
11	6705	Sct	18 51.1	−06 16	5.8	14	OC	*Wild Duck Cluster*	c	12
12	6218	Oph	16 47.2	−01 57	6.6	14.5	GC		c	12
13	6205	Her	16 41.7	+36 28	5.9	16.6	GC	*Hercules Cluster*	a c	5 6
14	6402	Oph	17 37.6	−03 15	7.6	11.7	GC		c	12
15	7078	Peg	21 30.0	+12 10	6.4	12.3	GC		c	13
16	6611	Ser	18 18.8	−13 47	6.0	35 × 28	N+OC	*Eagle Nebula*	c	12
17	6618	Sgr	18 20.8	−16 11	7	46 × 37	N+OC	*Omega Nebula*	c	12
18	6613	Sgr	18 19.9	−17 08	6.9	9	OC		c	12 18
19	6273	Oph	17 02.6	−26 16	7.2	13.5	GC		c d	12 18
20	6514	Sgr	18 02.6	−23 02	8.5	29 × 27	N	*Trifid Nebula*	c	12 18
21	6531	Sgr	18 04.6	−22 30	5.9	13	OC		c	12 18
22	6656	Sgr	18 36.4	−23 54	5.1	24	GC		c	12 18
23	6495	Sgr	17 56.8	−19 01	5.5	27	OC		c	12 18
24	—	Sgr	18 16.9	−18 29	4.5	90	—	Star cloud – not a real cluster	c	12 18
25	4525 (IC)	Sgr	18 31.6	−19 15	4.6	32	OC		c	12 18
26	6694	Sct	18 45.2	−09 24	8.0	15	OC		c	12
27	6853	Vul	19 59.6	+22 43	7.6	8 × 4	PN	*Dumbbell Nebula*	a c	6 7 12 13
28	6626	Sgr	18 24.5	−24 52	6.9	11.2	GC		c	12 18
29	6913	Cyg	20 23.9	+38 32	6.6	7	OC		a c	6 7
30	7099	Cap	21 40.4	−23 11	7.5	11	GC		c d	13 19
31	224	And	00 42.7	+41 16	3.5	178 × 63	GX	*Andromeda Galaxy*	a b c	2 7
32	221	And	00 42.7	+40 52	8.2	7.6 × 5.8	GX	Companion to M31	a b c	2 7
33	598	Tri	01 33.9	+30 39	5.7	62 × 39	GX	*Triangulum Galaxy*	a b	2
34	1039	Per	02 42.0	+42 47	5.2	35	OC		a b	2 3

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Table B *The Messier objects (continued)*

Messier number	NGC/IC	Con	RA h	RA m	Dec °	Dec ′	Mag	Size ′	Type *	Common name / note	Chart numbers Messier	Main		
35	2168	Gem	06	08.9	+24	20	5.1	28	OC		b	3	9	
36	1960	Aur	05	36.1	+34	08	6.0	12	OC		a b	3		
37	2099	Aur	05	52.4	+32	33	5.6	24	OC		a b	3		
38	1912	Aur	05	28.7	+35	50	6.4	21	OC		a b	3		
39	7092	Cyg	21	32.2	+48	26	4.6	32	OC		a c	1	6	7
40	—	UMa	12	22.4	+58	05	8		—	Double star	a b c	1	4	5
41	2287	CMa	06	47.0	−20	44	4.5	38	OC		b	9	15	
42	1976	Ori	05	35.4	−05	27	4	66 × 60	N	*Great Orion Nebula*	b	9		
43	1982	Ori	05	35.6	−05	16	9	20 × 15	N	Extension of M42	b	9		
44	2632	Cnc	08	40.1	+19	59	3.1	95	OC	*Praesepe; Beehive Cluster*	a b	3	4	9 10
45	—	Tau	03	47.0	+24	07	1.2	110	OC	*Pleiades; Seven Sisters*	a b	2	3	8 9
46	2437	Pup	07	41.8	−14	49	6.1	27	OC		b	9	10	15 16
47	2422	Pup	07	36.6	−14	30	4.4	30	OC		b	9	10	15 16
48	2548	Hya	08	13.8	−05	48	5.8	54	OC		b	9	10	
49	4472	Vir	12	29.8	+08	00	8.4	8.9 × 7.4	GX		b c	10	11	
50	2323	Mon	07	03.2	−08	20	5.9	16	OC		b	9		
51	5194, 5195	CVn	13	29.9	+47	12	8.4	11.0 × 7.8	GX	*Whirlpool Galaxy*	a c	4	5	
52	7654	Cas	23	24.2	+61	35	6.9	13	OC		a	1	2	7
53	5024	Com	13	12.9	+18	10	7.7	12.6	GC		c	5	11	
54	6715	Sgr	18	55.1	−30	29	7.7	9.1	GC		c d	18	19	
55	6809	Sgr	19	40.0	−38	58	7.0	19.0	GC		c d	18	19	
56	6779	Lyr	19	16.6	+30	11	8.2	7.1	GC		a c	6	7	
57	6720	Lyr	18	53.6	+33	02	9.7	1.2	PL	*Ring Nebula*	a c	6	7	
58	4579	Vir	12	37.7	+11	49	9.8	5.4 × 4.4	GX		b c	10	11	
59	4621	Vir	12	42.0	+11	39	9.8	5.1 × 3.4	GX		b c	11		
60	4649	Vir	12	43.7	+11	33	8.8	7.2 × 6.2	GX		b c	11		
61	4303	Vir	12	21.9	+04	28	9.7	6.0 × 5.5	GX		b c	10	11	
62	6266	Oph	17	01.2	−30	07	6.6	14.1	GC		c d	17	18	
63	5055	CVn	13	15.8	+41	02	8.6	12.3 × 7.6	GX	*Sunflower Galaxy*	a c	4	5	
64	4826	Com	12	56.7	+21	41	8.5	9.3 × 5.4	GX	*Black-Eye Galaxy*	b c	5	11	
65	3623	Leo	11	18.9	+13	05	9.3	10.0 × 3.3	GX		b c	10	11	
66	3627	Leo	11	20.2	+12	59	9.0	8.7 × 4.4	GX		b c	10	11	
67	2682	Cnc	08	50.4	+11	49	6.9	30	OC		a b	10		
68	4590	Hya	12	39.5	−26	45	8.2	12.0	GC		b c d	10	11	16 17
69	6637	Sgr	18	31.4	−32	21	7.7	7.1	GC		c d	18		
70	6681	Sgr	18	43.2	−32	18	8.1	7.8	GC		c d	18		
71	6838	Sge	19	53.8	+18	47	8.3	7.2	GC		c	6	7	12 13
72	6981	Aqr	20	53.5	−12	32	9.4	5.9	GC		c d	13		
73	6997	Aqr	20	58.9	−12	38	8.9	2.8	—	Not a real cluster	c d	13		
74	628	Psc	01	36.7	+15	47	9.2	10.2 × 9.5	GX		c	8		
75	6864	Sgr	20	06.1	−21	55	8.6	6.0	GC		c d	12	13	18 19
76	650, 651	Per	01	42.4	+51	34	12.2	2 × 1	PL	*Little Dumbbell Nebula*	a b	1	2	3 7
77	1068	Cet	02	42.7	−00	01	8.8	6.9 × 5.9	GX		b	8		
78	2068	Ori	05	46.7	+00	03	8	8 × 6	N		b	9		
79	1904	Lep	05	24.5	−24	33	8.0	8.7	GC		b	9	15	
80	6093	Sco	16	17.0	−22	59	7.2	8.9	GC		c d	11	12	17 18
81	3031	UMa	09	55.6	+69	04	6.9	25.7 × 14.1	GX	*Bode's Galaxy*	a	1	4	
82	3034	UMa	09	55.8	+69	41	8.4	11.2 × 4.6	GX	*Cigar Galaxy*	a	1	4	
83	5236	Hya	13	37.0	−29	52	8.2	11.2 × 10.2	GX	*Southern Pinwheel Galaxy*	c d	17		
84	4374	Vir	12	25.1	+12	53	9.3	5.0 × 4.4	GX		b c	4	10	11
85	4382	Com	12	25.4	+18	11	9.2	7.1 × 5.2	GX		b c	4	5	10 11
86	4406	Vir	12	26.2	+12	57	9.2	7.5 × 5.5	GX		b c	4	10	11
87	4486	Vir	12	30.8	+12	24	8.6	7.2 × 6.8	GX	Virgo A	b c	10	11	
88	4501	Com	12	32.0	+14	25	9.5	6.9 × 3.9	GX		b c	5	10	11
89	4552	Vir	12	35.7	+12	33	9.8	4.2 × 4.2	GX		b c	10	11	
90	4569	Vir	12	36.8	+13	10	9.5	9.5 × 4.7	GX		b c	10	11	
91	4548	Com	12	35.4	+14	30	10.2	5.4 × 4.4	GX		b c	5	10	11
92	6341	Her	17	17.1	+43	08	6.5	11.2	GC		a c	5	6	
93	2447	Pup	07	44.6	−23	52	6.2	22	OC		b d	9	10	15 16
94	4736	CVn	12	50.9	+41	07	8.2	11.0 × 9.1	GX		a b c	4	5	
95	3351	Leo	10	44.0	+11	42	9.7	7.4 × 5.1	GX		b	10		
96	3368	Leo	10	46.8	+11	49	9.2	7.1 × 5.1	GX		b	10		
97	3587	UMa	11	14.8	+55	01	12.0	3.2	PL	*Owl Nebula*	a b c	1	4	5
98	4192	Com	12	13.8	+14	54	10.1	9.5 × 3.2	GX		b c	4	5	10 11
99	4254	Com	12	18.8	+14	25	9.8	5.4 × 4.8	GX		b c	4	5	10 11
100	4321	Com	12	22.9	+15	49	9.4	6.9 × 6.2	GX		b c	4	5	10 11
101	5457	UMa	14	03.2	+54	21	7.7	26.9 × 26.3	GX	*Pinwheel Galaxy*	a c	1	4	5 6
102	5866	Dra	15	06.5	+55	46	10.0	5.2 × 2.3	GX	*Spindle Galaxy*	a c	1	5	6
103	581	Cas	01	33.2	+60	42	7.4	6	OC		a b	1	2	3 7
104	4594	Vir	12	40.0	−11	37	8.3	8.9 × 4.1	GX	*Sombrero Galaxy*	b c	10	11	
105	3379	Leo	10	47.8	+12	35	9.3	4.5 × 4.0	GX		b	10		
106	4258	CVn	12	19.0	+47	18	8.3	18.2 × 7.9	GX		a b c	4	5	
107	6171	Oph	16	32.5	−13	03	8.1	10.0	GC		c	11	12	
108	3556	UMa	11	11.5	+55	40	10.1	8.3 × 2.5	GX		a b c	1	4	5
109	3992	UMa	11	57.6	+53	23	9.8	7.6 × 4.9	GX		a b c	1	4	5
110	205	And	00	40.4	+41	41	8.0	17.4 × 9.8	GX	Companion to M31	a b c	2	7	

* OC = Open star cluster GC = Globular cluster N = (Diffuse) nebula PL = Planetary nebula GX = Galaxy

(You can find a description of these different types of objects on pages 36 and 37.)

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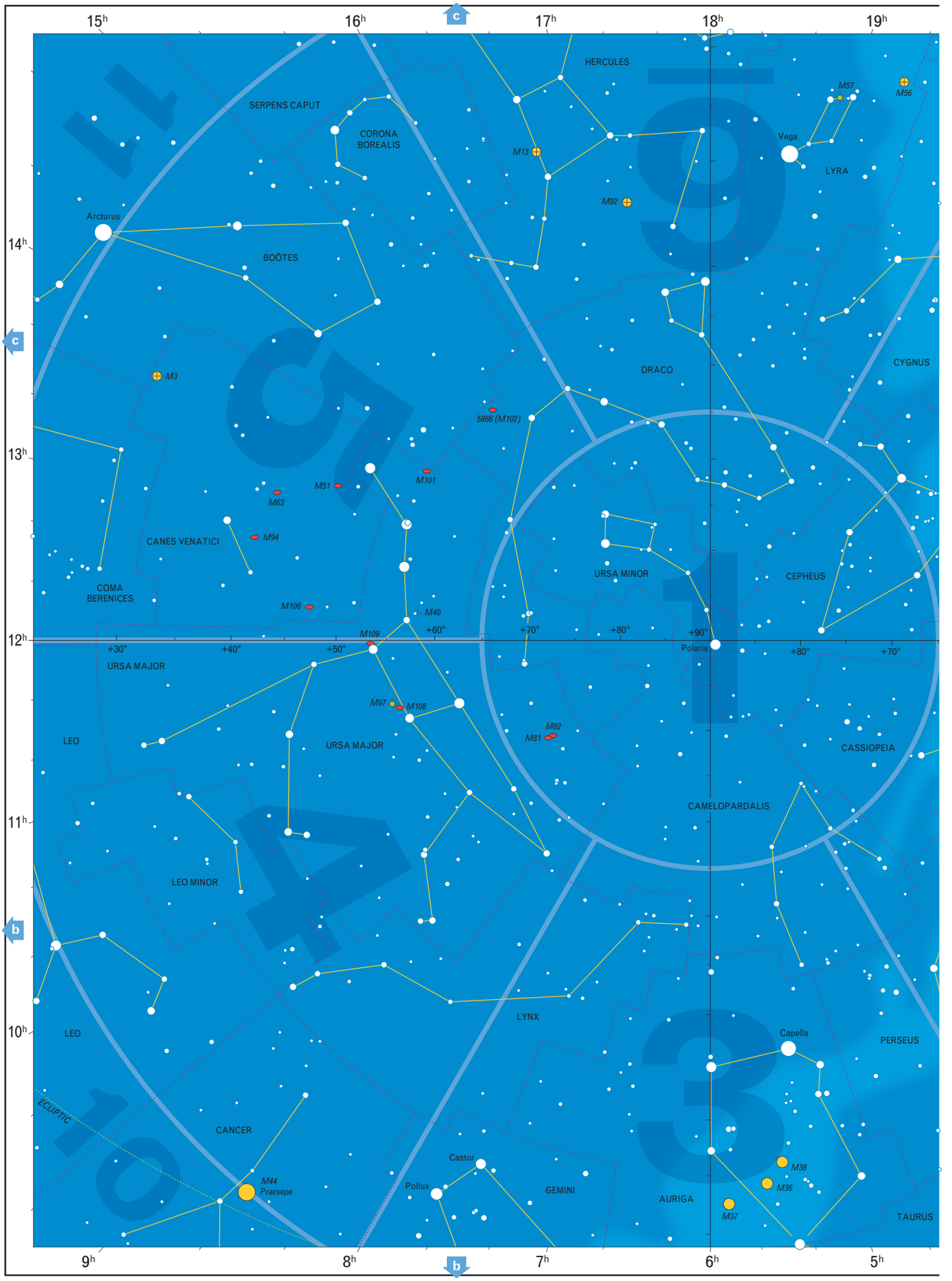
a

Messier & Index Chart



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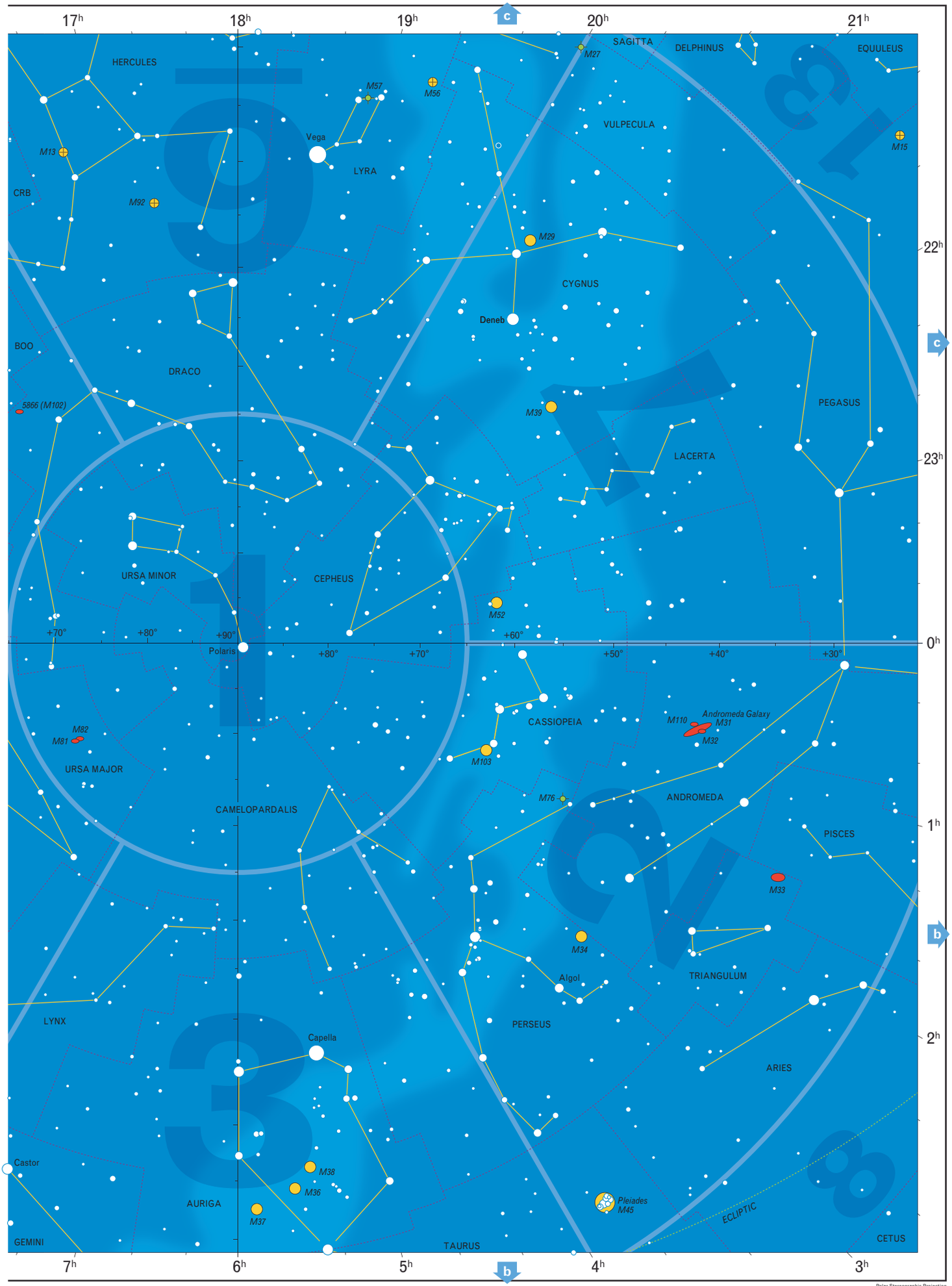
Northern Sky

a



Polar Stereographic Projection

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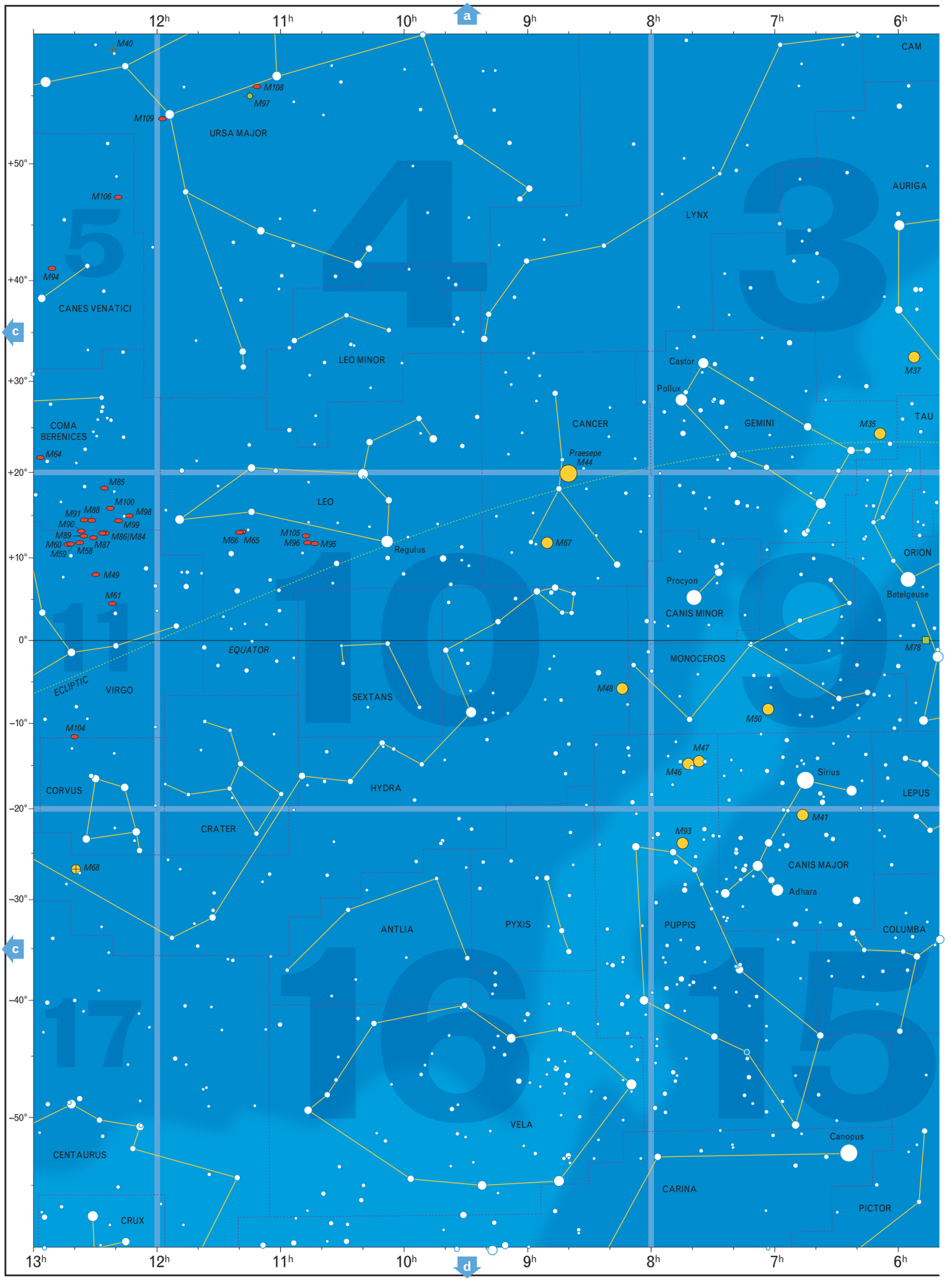
b

Messier & Index Chart



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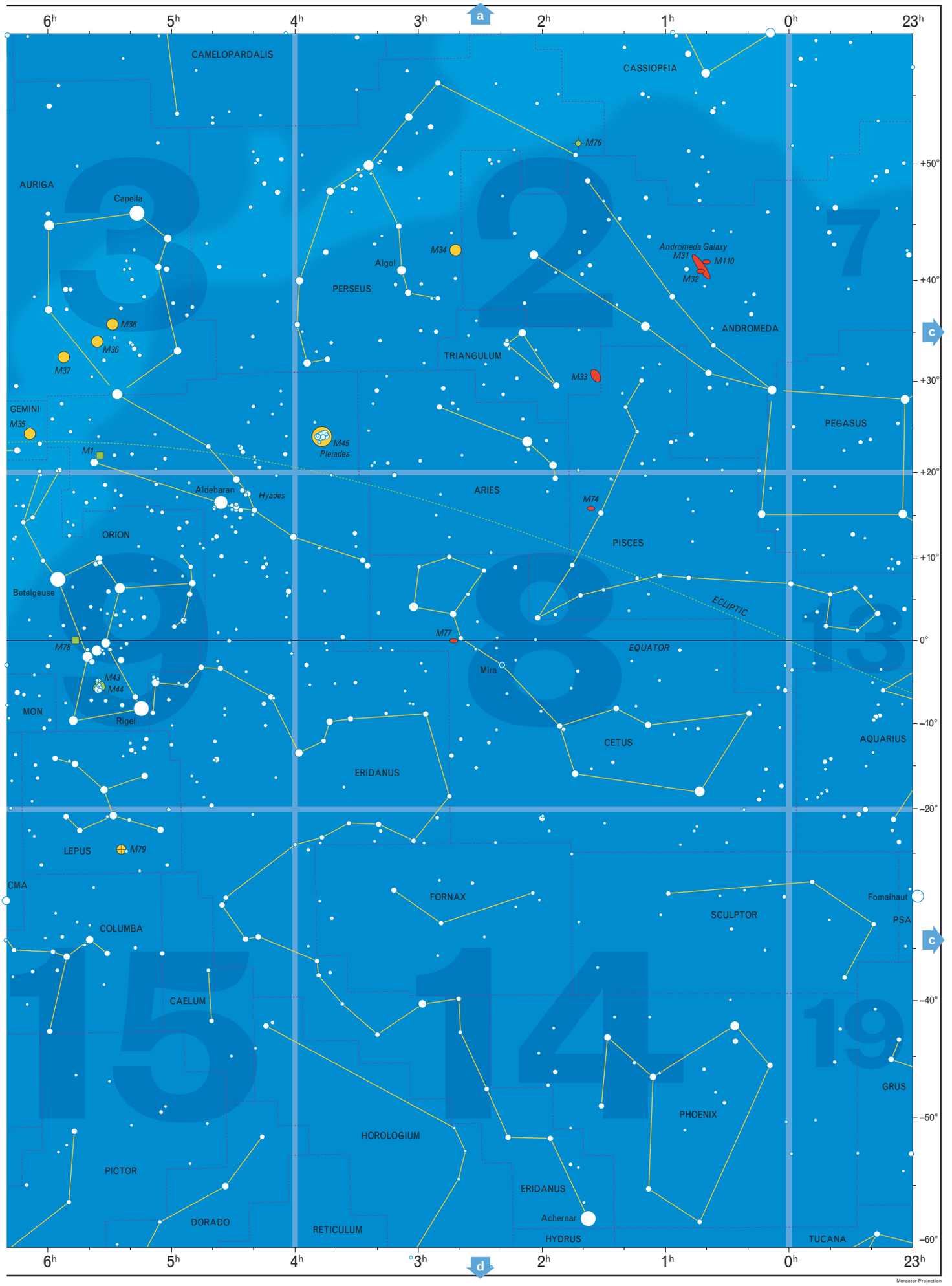
Equatorial (RA 0h – 12h)

b



Mercator Projection

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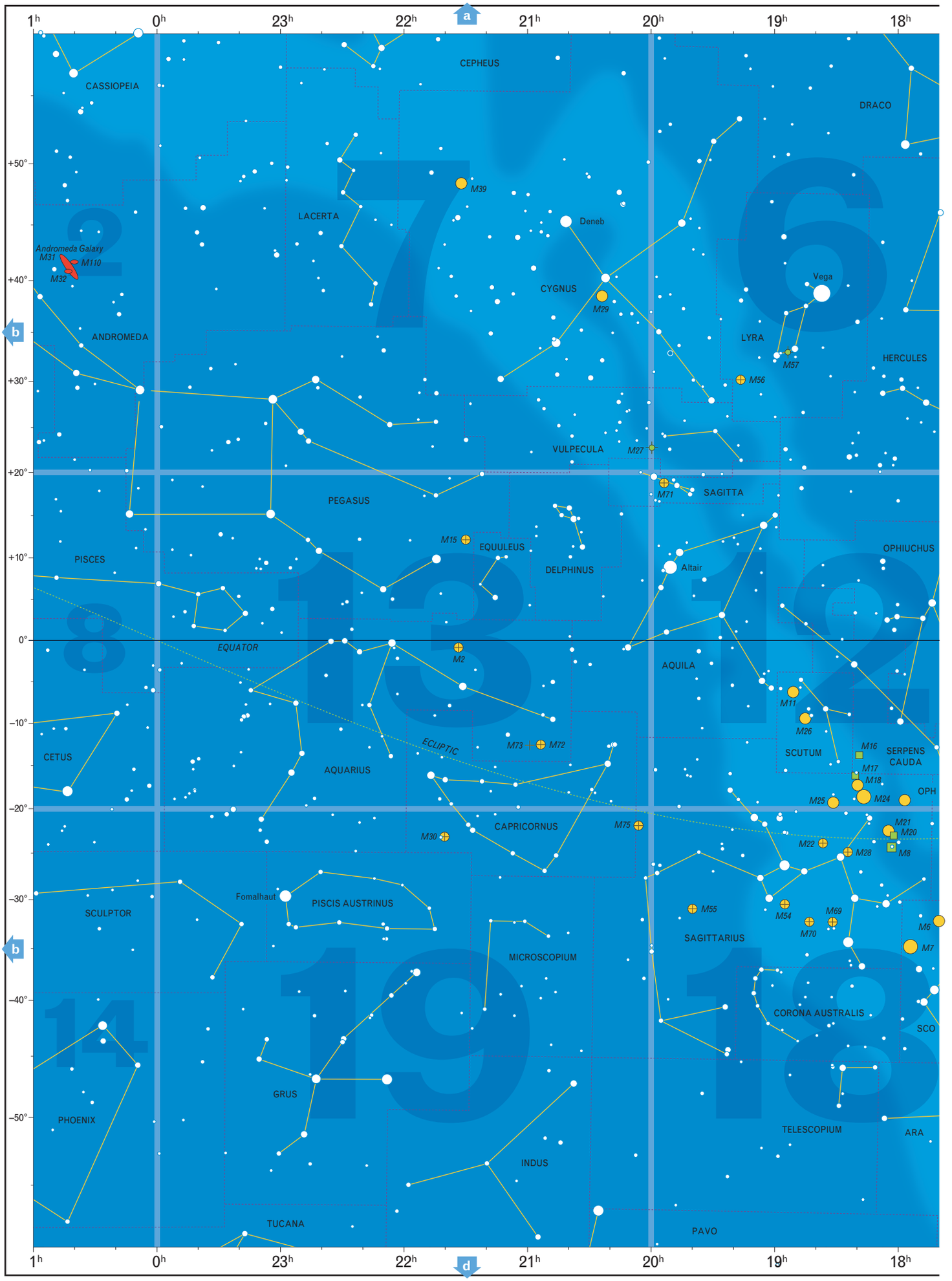
C

Messier & Index Chart



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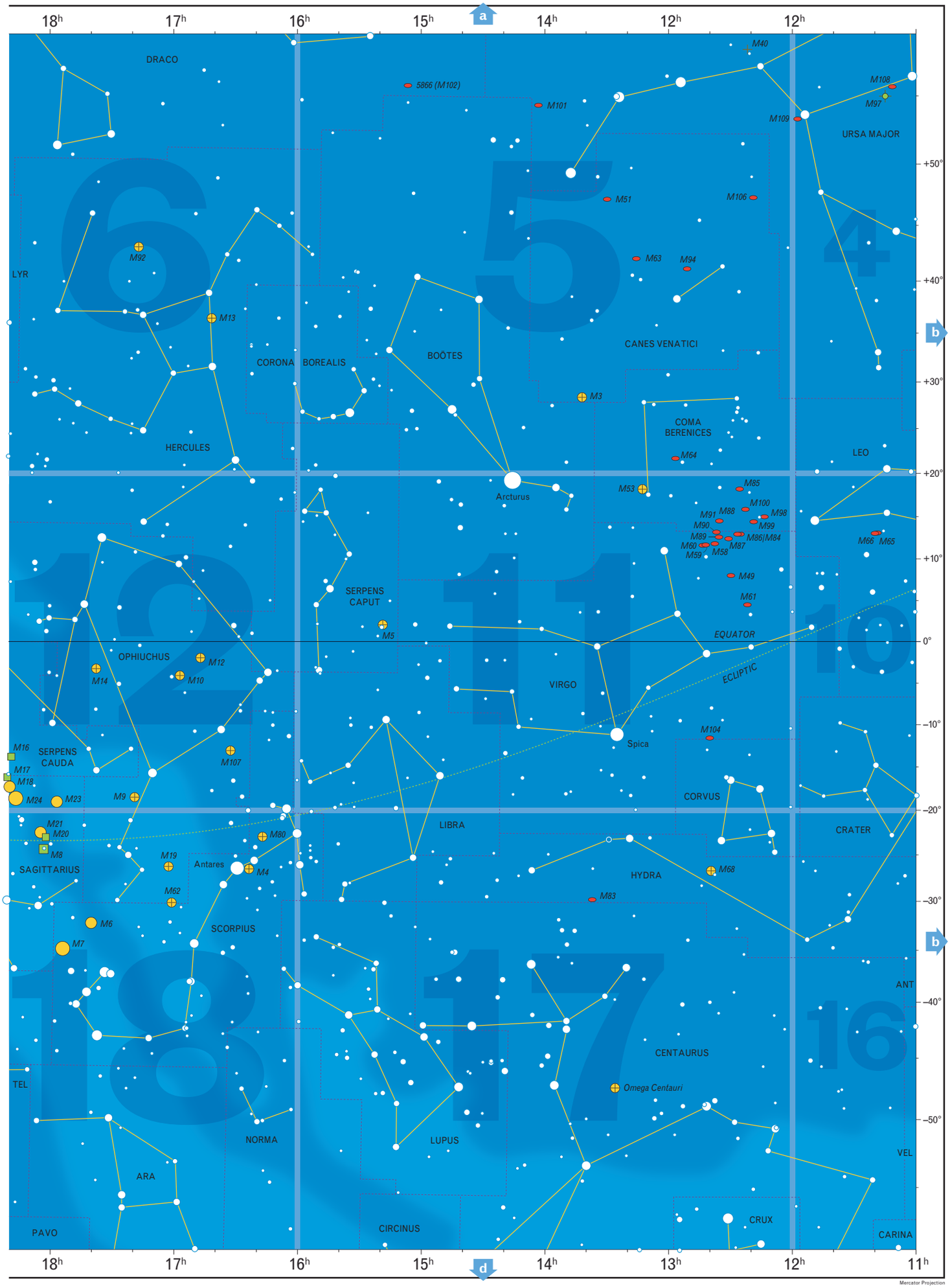
Equatorial (RA 12h – 0h)



Mercator Projection

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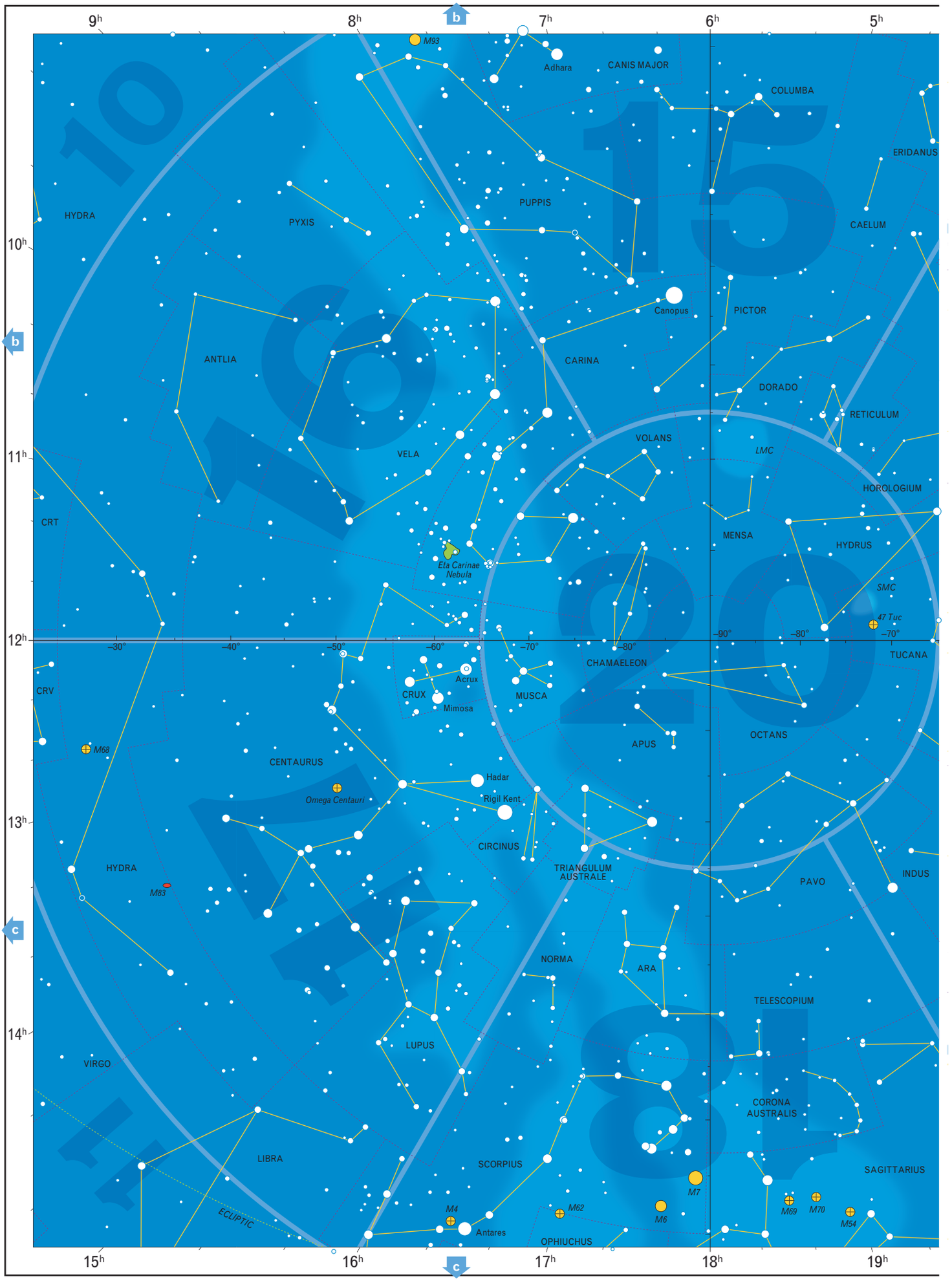
Messier & Index Chart



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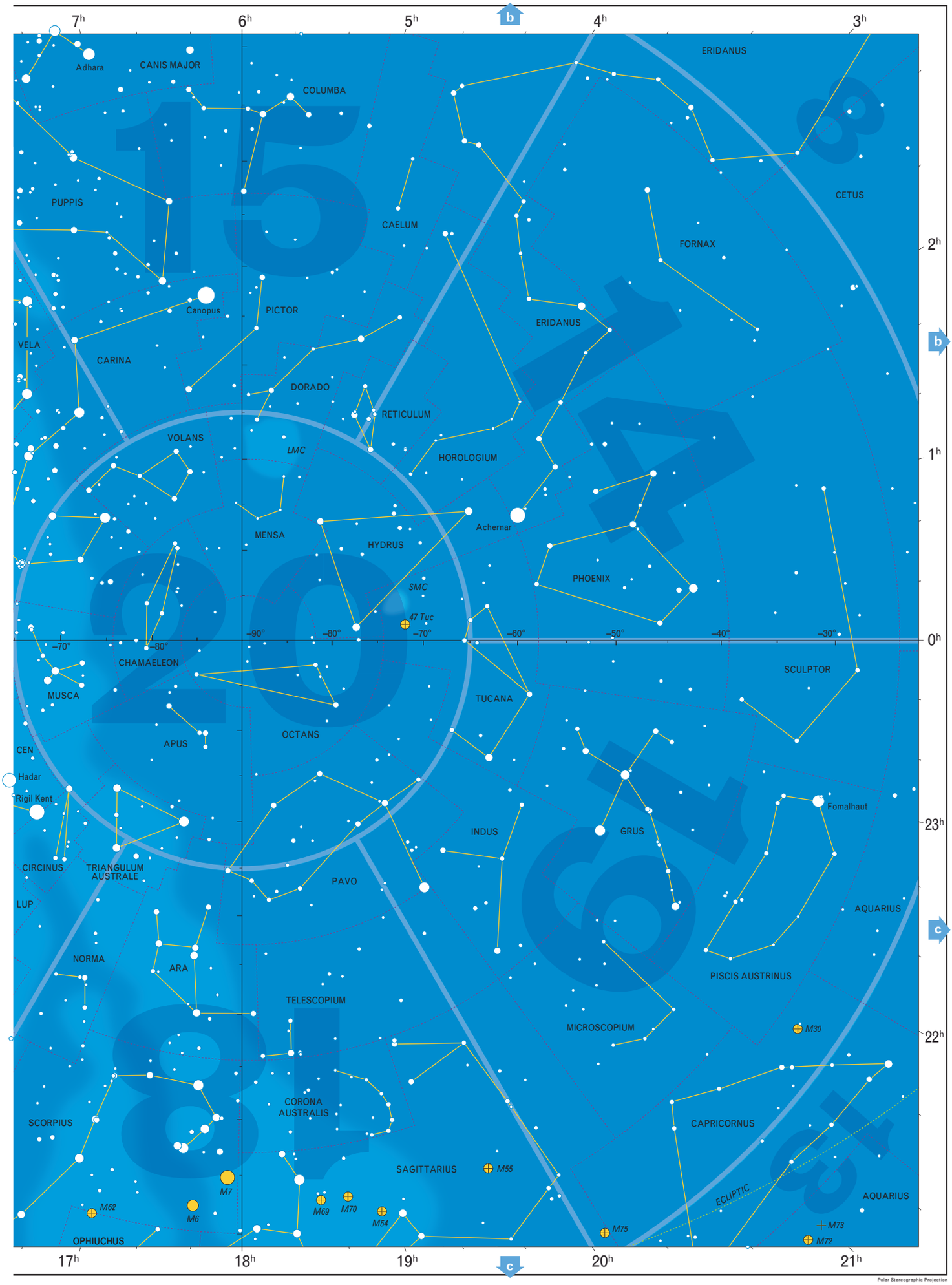
Southern Sky



Polar Stereographic Projection

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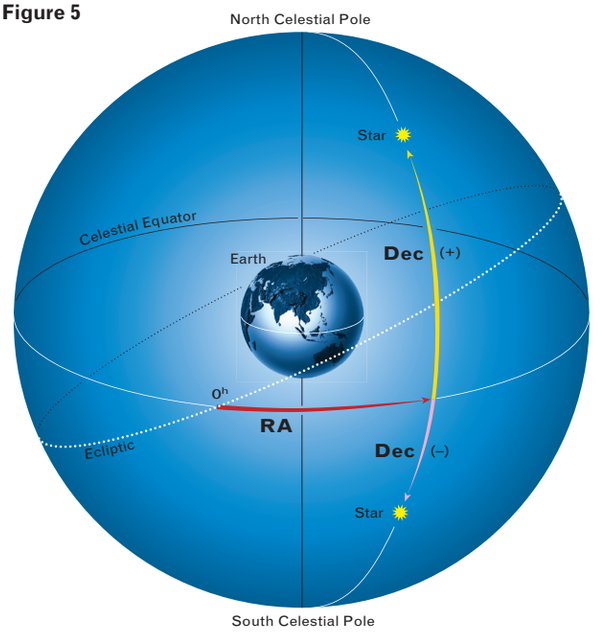
STAR CHARTS

Once you are familiar with the sky and can recognize the different constellations, you will want to know more about what is visible in the night sky. So the next step is to use the star charts in this chapter, the 'heart' of *The Cambridge Star Atlas*. These star charts divide the sky into 20 parts. The actual chart areas are shown on the index to the star charts on page 39, preceding the star charts themselves and also on the Messier charts on pages 22–29. There is a generous overlap between the charts, so most of the constellations are shown complete on at least one chart. The positions of stars and objects are for the year 2000 or, to be more precise, the epoch is 2000.0 (the extra 0 is a decimal and it means January 1; for example 2000.5 would be July 1). The positions are plotted against a grid of right ascension (RA) and declination (Dec) comparable with longitude and latitude on the Earth's globe. *Right ascension* (RA) is reckoned in hours, minutes, and seconds from 0^h to 24^h, and is measured from west to east along the Equator. *Declination* (Dec) represents the angular distance between an object and the celestial Equator, (+) for objects north and (–) for those south of the Equator (figure 5).

Figure 5



The charts' projections have been chosen carefully to show the star patterns with the least possible distortion and to make it easy to measure positions from the maps. The tick marks along the chart borders and on the central RA line (horizontal RA line on the polar maps) will also help you.

Stars

Stars are huge balls of hot gas, like our own Sun, but much further away than the Sun. Although they appear as small points of light (so small that even in the largest telescopes most of them cannot be measured) many stars are even bigger than our Sun, which turns out to be of only average size. Some stars, like Betelgeuse (in Orion) and Antares (in Scorpius), have diameters that are close to half a billion kilometers (300 times that of our Sun). Even that is not the limit: some stars have diameters a thousand times larger than our Sun. At the other end of the scale are stars that are no bigger than the Earth, and some that are even smaller.

It is not only the sizes of stars that differ, but also their temperatures. The temperature of the Sun is almost 5,500 °C. That is just its surface temperature; in the nucleus of the Sun the temperature reaches millions of degrees. The Sun is a star that is radiating yellowish light. 'Cooler' stars are orange (like Aldebaran in Taurus, or Arcturus in Boötes, with surface temperatures of 4,000 °C) or red (Betelgeuse and Antares; 3,000 °C). But many stars are much hotter than the Sun. White stars have temperatures between 6,000 and 10,000 °C (Sirius in Canis Major, or Deneb in Cygnus). Then there are the bluish stars with temperatures between 11,000 and 40,000 °C (like Rigel in Orion). It is interesting to take a look at the beautiful constellation Orion on a dark night in December or January. You can clearly see the difference between the red giant star Betelgeuse and the bluish Rigel. Try it.

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Stars are divided into spectral classes, according to differences in their spectra. These differences are related to the surface temperatures and the colors of the stars. The hottest, bluish stars are the classes O, B and A, the slightly cooler white stars are class F, yellow class G, orange class K, and the coolest, the red stars, are class M. To remember this rather illogical sequence of letters, use the sentence: **O**h, **B**e **A F**ine **G**irl, **K**iss **M**e! or if you prefer: **O**h, **B**e **A F**ine **G**uy, **K**iss **M**e! In the tables facing the star charts, the spectral classes of variable stars are given in the final column. The spectral types of the 96 brightest stars can be found in table C on the next two pages.

Magnitudes

The word *magnitude* usually refers to the apparent brightness of a star or an object. Traditionally, stars visible to the naked eye were classified into six groups of brightness. The most prominent stars in the sky were called first magnitude stars, the ones slightly fainter (e.g. the Pole Star and the brightest stars of the Great Bear) second magnitude and so on. The faintest stars visible to the eye were magnitude six. Nowadays astronomers are able to measure the brightness very accurately. In modern catalogs you will find magnitude to two decimal places and the scale now has a logarithmic basis. A difference of five magnitudes is defined as being 100 times as bright. Consequently one magnitude represents a difference of 2.5 times (or to be precise 2.512 times, the fifth root of 100). On this scale several stars turn out to be brighter than 1, so the scale was extended to 0, but even that was not enough. A few stars are brighter still and are given a negative magnitude. The brightest star in the sky, Sirius, has a magnitude of –1.44, the second brightest, Canopus, is of magnitude –0.62.

On the seasonal sky maps (pages 12–19), the brightness of a star is rounded to the nearest whole magnitude. Stars between 0.5 and 1.5 are classified as magnitude 1, between 1.5 and 2.5 magnitude 2 and so on. For the star charts (pages 40–79), stars are classified to half magnitudes. A detailed scale can be found in the legend at the right of each chart. Stars' positions and magnitudes are based on the information from the *Hipparcos* and *Tycho Catalogues* (ESA Publications, 1997). All together approximately 9,500 stars are plotted. Furthermore, the Atlas shows 921 non-stellar objects: star clusters, nebulae, and distant galaxies.

Since stars are at very different distances, the apparent, or visual (V), magnitude does not show how bright the star really is compared with other stars or with our own Sun. Astronomers use the term *absolute magnitude* for the real brightness of a star (M_V). The absolute magnitude tells you how bright a star would appear in the sky if it was at a distance of 10 parsecs. One parsec equals a distance of 3.26 light-years. So 10 parsecs equals 32.6 light-years, or in other words the distance light travels in 32.6 years. That is 9.46×10^{12} (9,460,000,000,000) kilometers. The speed of light is an amazing 299,792 kilometers per second.

In table C (pages 32–33) you will find both the *visual* (V) and the *absolute* (M_V) magnitudes, and a column telling you the distance in light-years. It is interesting to compare these columns. The brightest star in the sky (Sirius) is not really that bright when you compare its absolute magnitude (1.5) with that of Deneb (–7.5). This star shines about 1,500 times as bright as Sirius.

Although the Sun is not listed in the table, its absolute magnitude (4.8) shows that it is only a very average star, fainter than all the stars in the list, although it is obviously the brightest object in our sky, with a visual magnitude of –26.8. It shines so brightly because on the cosmic scale it is very close, 'only' 8 light-minutes! When you compare Deneb with our Sun you will find that it is almost 100,000 times as bright as the Sun.

A lower case letter v after an entry in the visual magnitude column in table C means that this is a so-called *variable star*. This is explained in section 'Variable stars' on page 34.

Stars names

Many of the brighter stars have proper names of Latin, Greek, or Arabic origin, such as Regulus, Aldebaran, and Betelgeuse. Only the brightest stars are still referred to by these old names. On the star

Continued on page 34

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Table C *The 96 brightest stars*

All stars brighter than magnitude 2.56 (V), in order of brightness

Star	Name	RA h	RA m	Dec °	Dec ′	Magnitudes V	Magnitudes M_v	Spectral type	Distance (light-years)	Chart numbers
α CMa	Sirius	06	45.2	−16	43	− 1.44	1.5	A0	9	9 15
α Car	Canopus	06	23.9	−52	41	− 0.62	−5.4	F0	313	14 15 16
α Cen	Rigil Kent	14	39.6	−60	50	− 0.29	4.0	G2 + K1	4	17 18 20
α Boo	Arcturus	14	15.7	+19	11	− 0.05	−0.6	K2	37	5 11
α Lyr	Vega	18	36.9	+38	47	0.03	0.6	A0	25	6 7
α Aur	Capella	05	16.7	+46	00	0.08	−0.8	G6	42	2 3
β Ori	Rigel	05	14.5	−08	12	0.18	−6.6	B8	773	9
α CMi	Procyon	07	39.3	+05	14	0.40	2.8	F5	11	9 10
α Ori	Betelgeuse	05	55.2	+07	24	0.45 v	−5.0	M2	427	9
α Eri	Achernar	01	37.6	−57	14	0.45	−2.9	B3	144	14 15 19 20
β Cen	Hadar	14	03.8	−60	22	0.61 v	−5.5	B1	525	16 17 18 20
α Aql	Altair	19	50.8	+08	52	0.76	2.1	A7	17	7 12 13
α Cru	Acrux	12	26.6	−63	06	0.77	−4.6	B0	321	16 17 20
α Tau	Aldebaran	04	35.9	+16	31	0.87 v	−0.8	K5	65	2 3 8 9
α Vir	Spica	13	25.2	−11	10	0.98 v	−3.6	B1	262	11
α Sco	Antares	16	29.4	−26	26	1.06 v	−5.8	M1	604	11 12 17 18
β Gem	Pollux	07	45.3	+28	02	1.16	1.1	K0	34	3 4 9 10
α PsA	Fomalhaut	22	57.7	−29	37	1.17	1.6	A3	25	14 19
α Cyg	Deneb	20	41.4	+45	17	1.25	−7.5	A2	3,262	6 7
β Cru	Mimosa	12	47.7	−59	41	1.25 v	−4.0	B0	353	16 17 20
α Leo	Regulus	10	08.4	+11	58	1.36	−0.6	B7	77	10
ε CMa	Adhara	06	58.6	−28	58	1.50	−4.1	B2	431	9 15 16
α Gem	Castor	07	34.6	+31	53	1.58	0.6	A2	52	3 4
γ Cru	Gacrux	12	31.2	−57	07	1.59 v	−0.8	M4	88	16 17 20
λ Sco	Shaula	17	33.6	−37	06	1.62 v	−3.6	B1	701	17 18
γ Ori	Bellatrix	05	25.1	+06	21	1.64	−2.8	B2	243	9
β Tau	Alnath	05	26.3	+28	36	1.65	−1.3	B7	131	3 9
β Car	Miaplacides	09	13.2	−69	43	1.67	−1.1	A2	111	16 20
ε Ori	Alnilam	05	36.2	−01	12	1.69	−6.6	B0	1,345	9
α Gru	Alnair	22	08.2	−46	58	1.73	−0.9	B7	101	14 18 19 20
ζ Ori	Alnitak	05	40.8	−01	57	1.74	−5.5	O9	816	9
γ Vel	—	08	09.5	−47	20	1.75 v	−5.8	WC8 + O9	842	15 16
ε UMa	Alioth	12	54.0	+55	58	1.76 v	−0.2	A0	81	1 4 5
α Per	Mirphak	03	24.3	+49	52	1.79	−4.9	F5	593	2 3
ε Sgr	Kaus Australis	18	24.2	−34	23	1.79	−1.4	B9	145	18
α UMa	Dubhe	11	03.7	+61	45	1.81	−1.3	F7	124	1 4 5
δ CMa	Wezen	07	08.4	−26	23	1.83	−7.2	F8	1,787	9 15 16
η UMa	Alkaid	13	47.5	+49	19	1.85	−1.8	B3	101	1 4 5 6
ε Car	Avior	08	22.5	−59	31	1.86	−4.8	K3 + B2	633	15 16 20
ϑ Sco	—	17	37.3	−43	00	1.86	−3.0	F1	272	17 18
β Aur	Menkalinan	05	59.5	+44	57	1.90 v	−0.2	A2	82	2 3 4
α TrA	Atria	16	48.7	−69	02	1.91	−5.0	K2	415	17 18 20
δ Vel	—	08	44.7	−54	43	1.93	0.0	A1	80	15 16 20
γ Gem	Alhena	06	37.7	+16	24	1.93	−0.6	A0	105	3 9
α Pav	Peacock	20	25.6	−56	44	1.94	−2.1	B2	183	18 19 20
α UMi	Polaris	02	31.8	+89	16	1.97 v	−4.1	F7	432	1
β CMa	Mirzam	06	22.7	−17	57	1.98 v	−4.0	B1	500	9 15
α Hya	Alphard	09	27.6	−08	39	1.99	−2.1	K3	177	10

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Table C *The 96 brightest stars (continued)*

All stars brighter than magnitude 2.56 (V), in order of brightness

Star	Name	RA h	RA m	Dec °	Dec ′	Magnitudes V	Magnitudes M_v	Spectral type	Distance (light-years)	Chart numbers
γ Leo	Algieba	10	20.0	+19	50	2.01	−2.2	K0	126	4 10
α Ari	Hamal	02	07.2	+23	28	2.01	0.5	K2	66	2 8
β Cet	Deneb Kaitos	00	43.6	−17	59	2.04	−1.0	K0	96	8 14
σ Sgr	Nunki	18	55.3	−26	18	2.05	−2.4	B2.5	224	12 18
β Gru	—	22	42.7	−46	53	2.06 v	−1.4	M5	170	14 19
ϑ Cen	Menkent	14	06.7	−36	22	2.06	0.1	K0	61	17
β UMi	Kochab	14	50.7	+74	09	2.07	−1.1	K4	126	1
α And	Alpheratz	00	08.4	+29	05	2.07	−0.6	B9	97	2 7 8 13
β And	Mirach	01	09.7	+35	37	2.07	−1.9	M0	199	2 7
κ Ori	Saiph	05	47.8	−09	40	2.07	−5.0	B0	721	9
α Oph	Rasalhague	17	34.9	+12	34	2.08	1.3	A5	47	12
β Per	Algol	03	08.2	+40	57	2.09 v	−0.5	B8	93	2 3
γ And	Almaak	02	03.9	+42	20	2.10	−3.0	B8	355	2 3 7
β Leo	Denebola	11	49.1	+14	34	2.14	1.9	A3	36	4 5 10 11
γ Cas	—	00	56.7	+60	43	2.15 v	−5.0	B0	613	1 2 7
γ Cen	—	12	41.5	−48	58	2.20	−0.6	A1	130	16 17
ζ Pup	—	08	03.6	−40	00	2.21	−6.1	O5	1,403	15 16
ι Car	Aspidiske	09	17.1	−59	17	2.21 v	−4.4	A8	694	15 16 20
α CrB	Alphekka	15	34.7	+26	43	2.22 v	0.3	A0	75	5 6 11 12
λ Vel	—	09	08.0	−43	26	2.23 v	−4.8	K4	572	15 16
γ Cyg	Sadr	20	22.2	+40	15	2.23	−4.1	F8	1,517	6 7
ζ UMa	Mizar	13	23.9	+54	56	2.23	0.3	A2	78	1 4 5 6
γ Dra	Etamin	17	56.6	+51	29	2.24	−1.1	K5	148	5 6 7
α Cas	Schedir	00	40.5	+56	32	2.24	−2.5	K0	229	1 2 7
δ Ori	Mintaka	05	32.0	−00	18	2.25 v	−0.6	O9	919	9
β Cas	Caph	00	09.2	+59	09	2.27 v	1.2	F2	54	1 2 7
ε Sco	—	16	50.2	−34	18	2.29	0.1	K2	65	17 18
α Lup	—	14	41.9	−47	23	2.29 v	−4.1	B1	548	17 18 20
ε Cen	—	13	39.9	−53	28	2.29 v	−3.3	B1	376	16 17 18 20
δ Sco	—	16	00.3	−22	37	2.29	−4.4	B0	401	11 12 17 18
η Cen	—	14	35.5	−42	10	2.33 v	−2.8	B1	309	17 18
β UMa	Merak	11	01.8	+56	23	2.34	0.4	A1	79	1 3 4 5
ε Boo	Izar	14	45.0	+27	04	2.35	−2.6	A0	210	5 11
ε Peg	Enif	21	44.2	+09	52	2.38 v	−5.2	K2	672	13
κ Sco	—	17	42.5	−39	02	2.39 v	−3.6	B1	464	17 18
α Phe	Ankaa	00	26.3	−42	18	2.40	−0.3	K0	77	14 19
γ UMa	Phad	11	53.8	+53	42	2.41	0.2	A0	84	1 4 5
η Oph	Sabik	17	10.4	−15	43	2.43	0.8	A2	84	12 18
β Peg	Scheat	23	03.8	+28	05	2.44 v	−1.7	M2	199	2 7 13
α Cep	Alderamin	21	18.6	+62	35	2.45	1.4	A7	49	1 6 7
η CMa	Aludra	07	24.1	−29	18	2.45	−7.5	B5	3,182	9 15 16
κ Vel	—	09	22.1	−55	00	2.47	−3.9	B2	539	15 16 17 20
ε Cyg	—	20	46.2	+33	58	2.48	0.7	K0	72	6 7
α Peg	Merkab	23	04.8	+15	12	2.49	−0.9	B9	140	7 13
α Cet	Menkar	03	02.3	+04	05	2.54	−1.7	M2	220	8
ζ Cen	—	13	55.5	−47	17	2.54	−2.9	B2	385	16 17 18 20
ζ Oph	—	16	37.2	−10	34	2.54	−4.3	O9	458	11 12
β Sco	Graffias	16	05.4	−19	48	2.56	−3.5	B1 + B2	530	11 12 17 18

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Table D *The Greek alphabet*

α	Alpha	ι	Iota	ρ	Rho
β	Beta	κ	Kappa	σ (ς)	Sigma
γ	Gamma	λ	Lambda	τ	Tau
δ	Delta	μ	Mu	υ	Upsilon
ε	Epsilon	ν	Nu	ϕ (φ)	Phi
ζ	Zeta	ξ	Xi	χ	Chi
η	Eta	ο	Omicron	ψ	Psi
θ (ϑ)	Theta	π	Pi	ω	Omega

charts you will find all proper names that are listed in table C. Most stars also bear designations of numbers and Greek letters. The German celestial cartographer Johann Bayer introduced the Greek letters in the beginning of the seventeenth century. In general, the brightest star in a constellation was given the first letter of the Greek alphabet, alpha (α). The second letter, beta (β), was assigned to the second brightest and so on, although there are many obvious exceptions to this rule. In table C you will find the Greek letters and their names.

Another way to identify stars is by numbers. In each constellation the stars are numbered in order of RA. These numbers are usually referred to as Flamsteed numbers. Most of the brighter stars have both a Greek letter and a Flamsteed number. On the star charts you will find all the Greek lettered stars and, in addition, the Flamsteed numbers for the other stars. Generally, when a star is referred to in the text or in a table by a Greek letter or by a Flamsteed number, the genitive form of the Latin constellation name, or its official abbreviation, follows it. So the star Deneb, in the constellation the Swan (Latin: *Cygnus*), can also be called Alpha Cygni or 50 Cygni (α Cyg, 50 Cyg). Table E, on page 35, gives the names of the constellations, the genitive form, the official abbreviation, and the common English names.

Variable stars (see next column) have a quite different nomenclature. Some have the regular star identification like Algol (β Per) or Mira (ο Cet) but most are labeled in a special way: by roman letters starting with R, then S, T etc. to Z. Then RR, RS, RT, . . . , RZ, next SS, ST, and so on up to ZZ. After these 54 the naming continues with AA, AB, . . . , AZ, then BB, BC and so on again up to QZ, giving a total 334. The next variable found in that constellation is called V335, then V336 and so on. These designations are also followed by the constellation name, as with the Greek letters and the Flamsteed numbers.

Constellations

Most of the constellations we know originate from Mesopotamian traditions and from Greek mythology, but over the centuries many other constellations have been added to the classical ones, especially in the southern sky. Several of these new constellations only had a short life, while others have survived. In 1930 the International Astronomical Union (IAU) finally adopted a list of 88 official constellations and the boundaries were also delimited once and for all. On our star charts these official boundaries are drawn as purple dashed lines. The 88 official constellations are listed in table E. The final column of the table gives the numbers of the charts where you can best find each of these constellations.

Variable stars

The brightness of many stars varies over longer or shorter periods of time. The most common reason for this is that the size of the star actually changes; the star pulsates. A well-known type of pulsating star is the Cepheid, named after Delta (δ) Cephei, a yellow supergiant, which regularly pulsates every few days or weeks. The Cepheids are divided into two classes: the classical (Cep) and the Population II (CW) Cepheids. They are important to astronomers because there is a relation between their period and luminosity. The brighter a Cepheid, the longer the period. When the period is measured, we know the real luminosity (*absolute* brightness) of the star. By comparing this with the amount of light we actually receive (apparent or *visual* brightness) we have an important tool for calculating the star's distance.

Another type of pulsating variable is named after the prototype Omicron (ο) Ceti, or Mira (M), a red giant. These variables do not have a strict period. Several other types of pulsating variables are also named after prototypes, like U Gem, R CrB, or RR Lyr.

Continued on page 36

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Table E *List of constellations*

	Name	Genitive	Abbreviation	Common name	Chart numbers		
1	**Andromeda**	Andromedae	And	*Andromeda*	2		
2	**Antlia**	Antliae	Ant	*Air Pump*	16		
3	**Apus**	Apodis	Aps	*Bird of Paradise*	20		
4	**Aquarius**	Aquarii	Aqr	*Water Carrier*	13		
5	**Aquila**	Aquilae	Aql	*Eagle*	12		
6	**Ara**	Arae	Ara	*Altar*	18		
7	**Aries**	Arietis	Ari	*Ram*	8	2	
8	**Auriga**	Aurigae	Aur	*Charioteer*	3		
9	**Boötes**	Boötis	Boo	*Herdsman*	5	11	
10	**Caelum**	Caeli	Cae	*Engraving Tool*	15		
11	**Camelopardalis**	Camelopardalis	Cam	*Giraffe*	1	3	
12	**Cancer**	Cancri	Cnc	*Crab*	10	4	
13	**Canes Venatici**	Canum Venaticorum	CVn	*Hunting Dogs*	5		
14	**Canis Major**	Canis Majoris	CMa	*Greater Dog*	9	15	
15	**Canis Minor**	Canis Minoris	CMi	*Lesser Dog*	9		
16	**Capricornus**	Capricorni	Cap	*Sea Goat*	13		
17	**Carina**	Carinae	Car	*Keel*	16	20	
18	**Cassiopeia**	Cassiopeiae	Cas	*Cassiopeia*	1	2	
19	**Centaurus**	Centauri	Cen	*Centaur*	17		
20	**Cepheus**	Cephei	Cep	*Cepheus*	1		
21	**Cetus**	Ceti	Cet	*Whale*	8		
22	**Chamaeleon**	Chamaeleonis	Cha	*Chameleon*	20		
23	**Circinus**	Circini	Cir	*Pair of Compasses*	17	20	
24	**Columba**	Columbae	Col	*Dove*	15		
25	**Coma Berenices**	Coma Berenicis	Com	*Berenice's Hair*	5	11	
26	**Corona Australis**	Coronae Australis	CrA	*Southern Crown*	18		
27	**Corona Borealis**	Coronae Borealis	CrB	*Northern Crown*	5	6	
28	**Corvus**	Corvi	Crv	*Crow*	11		
29	**Crater**	Crateris	Crt	*Cup*	10		
30	**Crux**	Crucis	Cru	*Southern Cross*	16	17	20
31	**Cygnus**	Cygni	Cyg	*Swan*	7		
32	**Delphinus**	Delphini	Del	*Dolphin*	13		
33	**Dorado**	Doradus	Dor	*Goldfish*	15		
34	**Draco**	Draconis	Dra	*Dragon*	1	6	
35	**Equuleus**	Equulei	Equ	*Little Horse*	13		
36	**Eridanus**	Eridani	Eri	*River Eridanus*	8	9	14
37	**Fornax**	Fornacis	For	*Furnace*	14		
38	**Gemini**	Geminorum	Gem	*Twins*	3	9	
39	**Grus**	Gruis	Gru	*Crane*	19		
40	**Hercules**	Herculis	Her	*Hercules*	6	12	
41	**Horologium**	Horologii	Hor	*Pendulum Clock*	14		
42	**Hydra**	Hydrae	Hya	*Water Snake*	10	16	17
43	**Hydrus**	Hydri	Hyi	*Lesser Water Snake*	20		
44	**Indus**	Indi	Ind	*Indian*	19	20	
45	**Lacerta**	Lacertae	Lac	*Lizard*	7		
46	**Leo**	Leonis	Leo	*Lion*	10	4	
47	**Leo Minor**	Leonis Minoris	LMi	*Lesser Lion*	4		
48	**Lepus**	Leporis	Lep	*Hare*	9		
49	**Libra**	Librae	Lib	*Scales*	11	17	
50	**Lupus**	Lupi	Lup	*Wolf*	17	18	
51	**Lynx**	Lyncis	Lyn	*Lynx*	4		
52	**Lyra**	Lyrae	Lyr	*Lyre*	6		
53	**Mensa**	Mensae	Men	*Table Mountain*	20		
54	**Microscopium**	Microscopii	Mic	*Microscope*	19		
55	**Monoceros**	Monocerotis	Mon	*Unicorn*	9		
56	**Musca**	Muscae	Mus	*Fly*	20		
57	**Norma**	Normae	Nor	*Level*	17	18	
58	**Octans**	Octantis	Oct	*Octant*	20		
59	**Ophiuchus**	Ophiuchi	Oph	*Serpent Holder*	12	18	
60	**Orion**	Orionis	Ori	*Orion, the Hunter*	9		
61	**Pavo**	Pavonis	Pav	*Peacock*	20	18	
62	**Pegasus**	Pegasi	Peg	*Pegasus*	13	7	
63	**Perseus**	Persei	Per	*Perseus*	2	3	
64	**Phoenix**	Phoenicis	Phe	*Phoenix*	14		
65	**Pictor**	Pictoris	Pic	*Painter's Easel*	15		
66	**Pisces**	Piscium	Psc	*Fishes*	8	13	2
67	**Piscis Austrinus**	Piscis Austrini	PsA	*Southern Fish*	19		
68	**Puppis**	Puppis	Pup	*Stern*	15	9	
69	**Pyxis**	Pyxidis	Pyx	*Mariner's Compass*	16		
70	**Reticulum**	Reticuli	Ret	*Net*	14	15	
71	**Sagitta**	Sagittae	Sge	*Arrow*	6	12	
72	**Sagittarius**	Sagittarii	Sgr	*Archer*	18	12	
73	**Scorpius**	Scorpii	Sco	*Scorpion*	18	12	
74	**Sculptor**	Sculptoris	Scl	*Sculptor*	14	19	
75	**Scutum**	Scuti	Sct	*Shield*	12		
76	**Serpens**	Serpentis	Ser	*Serpent*	12	11	
77	**Sextans**	Sextantis	Sex	*Sextant*	10		
78	**Taurus**	Tauri	Tau	*Bull*	9	3	
79	**Telescopium**	Telescopii	Tel	*Telescope*	18	19	
80	**Triangulum**	Trianguli	Tri	*Triangle*	2		
81	**Triangulum Australe**	Trianguli Australis	TrA	*Southern Triangle*	20		
82	**Tucana**	Tucanae	Tuc	*Toucan*	20		
83	**Ursa Major**	Ursae Majoris	UMa	*Great Bear*	4	1	
84	**Ursa Minor**	Ursae Minoris	UMi	*Lesser Bear*	1		
85	**Vela**	Velorum	Vel	*Sail*	16		
86	**Virgo**	Virginis	Vir	*Virgin*	11		
87	**Volans**	Volantis	Vol	*Flying Fish*	20		
88	**Vulpecula**	Vulpeculae	Vul	*Fox*	6	7	

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There is also a completely different type of variable star: the eclipsing variable. An eclipsing variable star is a double star in mutual orbit and one component periodically moves in front of or behind the other, causing a drop in the total amount of light we receive. The best-known example of this type is Beta (β) Persei (Algol). Eclipsing variables are referred to in the star chart tables as type E, subdivided by the shape of their light curves into E, EA, EB, and EW.

A further group is termed the eruptive variables. These undergo a very sudden and very large increase in brightness. The best known of these are the novae (N) and the supernovae (SN). A nova is a very close double star, in which one component is a white dwarf: a small but very compact star. Gas from the other component flows into the white dwarf and eventually it ignites in a huge explosion. The brightness of the star increases temporarily by thousands of times. Some novae erupt more than once. These are known as recurrent novae (Rn).

A supernova is even more spectacular. It is the catastrophic death of a very hot star. The star's life ends when it blows itself up and for a short period it shines millions of times brighter than it once did. After the star has faded again the outer shells of the star form a slowly expanding nebula. The Crab Nebula (M1) in Taurus (the Bull) is one example. In the star charts all variable stars with a maximum of magnitude 6.5 or brighter are plotted.

Double stars

The majority of stars are double or multiple stars. Sometimes two stars appear very close in the sky, but are really only on the same line of sight; their distances differ considerably. These are called optical double stars. Real physical double stars belong together and are also called binaries. They are tied together by gravity and are in mutual orbit. The same goes for triple, quadruple, and even larger families of stars. Their apparent separation is measured in minutes and seconds of arc. One degree (°) can be divided into 60 minutes (′) and one minute divided again into 60 seconds (″). The separation is given in the tables (column with heading Sep) in seconds of arc. There is also a column with the heading PA, meaning position angle. This gives the angular position of the fainter component in relation to the brighter one. The angle is measured from the north, eastward. Bear in mind that in the sky east and west are reversed. So, when north is up, east is to the left! Consequently, the position angle is measured counter-clockwise.

All double stars with a combined (integrated) magnitude of 6.5 or brighter are plotted on the charts. The star chart tables contain only a selection of the finest targets. People who are especially interested in observing double stars should consider *The Cambridge Double Star Atlas* (see Sources and references, on page 90).

Open and globular clusters

Open star clusters appear on the star charts as yellow disks with green outlines. Globular clusters are also shown the same way, but with green crosses through their centers. Open clusters are usually found near the plane of the Milky Way, and so they can be found in or close to lighter areas on the charts, representing the brightest parts of the Milky Way. Open clusters are groups of young stars, often hot and bluish, and their individual stars can be seen easily with a small telescope or sometimes with the naked eye. The last column of this section of the star chart table (N*) gives the approximate number of stars in the cluster.

Globular clusters are quite different. They contain larger numbers of stars and are much more compact. They are found outside the Galactic plane and the stars are older. All clusters down to magnitude 10 are plotted on the star charts. The diameter (Diam) in the star chart table is given in minutes (′) of arc.

In the first column of the star chart tables you will find the designation of the cluster. First the NGC or IC numbers are listed (NGC stands for the *New General Catalogue*; IC for *Index Catalogue* or the *Second Index Catalogue*). NGC numbers are without a prefix (both on the charts and in the tables), and IC numbers have the prefix 'I.'. Alternative names, as well as Messier numbers (M), are in the second column. The same goes for nebulae and galaxies.

Diffuse and planetary nebulae

Diffuse nebulae are areas of the raw materials, dust

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and gas, from which stars are born. These diffuse nebulae are also found along the spiral arms of the Milky Way, and are visible in other nearby galaxies as well. There are three general types of diffuse nebulae. In an *emission nebulae* (E) one or more hot stars causes the nebula to emit light of its own. A *reflection nebula* (R) only reflects light from nearby stars. Reflection nebulae show a blue color, in contrast to the reddish glow of emission nebulae. The third type is the dark nebula. Most dark nebulae are not easily found in amateur telescopes. Only one is shown on the maps: the Coal Sack in the constellation Crux (Southern Cross), a dark patch in the Milky Way visible with the naked eye.

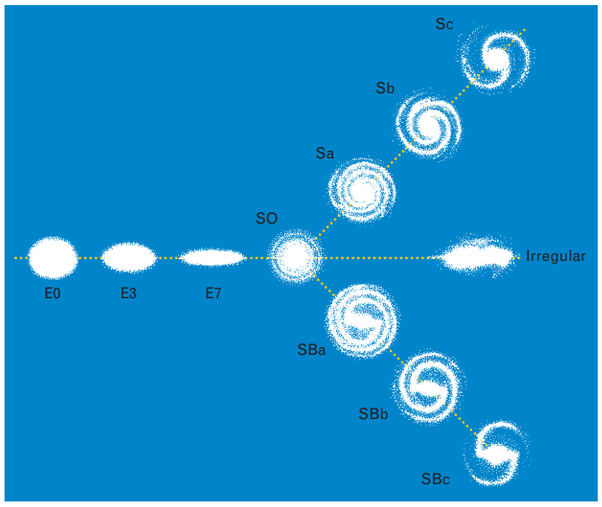
Planetary nebulae have nothing to do with planets. The name arose from their disk-like appearance. They are almost spherical cast-off shells of gas from very hot stars, late in their life-spans. Often the ionized gas has a greenish color. Examples are the Ring Nebula (M57) in Lyra (the Lyre) and the Helix Nebula (NGC 7293) in Aquarius (the Water Carrier).

Both bright diffuse nebulae and planetary nebulae are shown in soft green on the atlas charts. The larger nebulae are drawn to scale, and the smaller ones are shown as small green boxes.

Galaxies

The red ovals on the charts are the most remote objects: the galaxies. Galaxies are huge systems of stars, clusters and nebulae, like our own Milky Way. There are several types of galaxy: the elliptical (E), spiral (S), barred spiral (SB), and irregular. The E type is subdivided according to shape: from E0 for the almost spherical to E7 for the flattened lens shape. The S and SB types are subdivided according to how tightly the spiral arms are wound (see figure 6).

Figure 6



The Galactic Equator

On the charts the Galactic Equator is drawn as a blue dashed line. It represents the projection of the plane of our galaxy on the stellar sphere. Every ten degrees of galactic longitude is marked along this equator. The center of our Milky Way is at 0° galactic longitude, and can be found on chart 18, in Sagittarius, close to the Ophiuchus boundary.

The ecliptic

The *ecliptic* is the projection of the Earth's orbit around the Sun, or the yearly path of the Sun along the sky, caused by the orbital movement of the Earth. It is also shown on the charts as a green dashed line. Every ten degrees of longitude is marked. The ecliptic longitude starts at the vernal equinox, at right ascension 0^h and declination 0° (charts 8 and 13). The vernal equinox marks the Sun's position when it is exactly in the plane of the Earth's Equator, around March 21 each year.

The Moon and the planets

The Moon and the planets will not be found on a regular star chart, and the charts in this atlas are no exception. Like the Earth, the other planets of our solar system orbit the Sun, and the Moon orbits the Earth. For that reason they are always changing their position in relation to the background of 'fixed' stars. But since the orbits of the Moon and the planets, including the Earth, lie almost in the same plane, they can always be found close to the ecliptic.

If you want actual information on where to find the planets you can consult one of the many astronomical yearbooks or magazines that are available. Astronomical computer programs can also be very helpful by showing their positions in the sky for any date and time.

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Abbreviations used in the star chart tables

A table, giving information for all of the interesting telescopic objects on the charts, accompanies each star chart. The listing is restricted to the main regions of each chart excluding areas of overlap. These regions are indicated in each table heading and are shown on the Index to the star charts on the facing page, as well as on the Messier charts on pages 22–29. The constellation abbreviations follow the official IAU practice (see the list of constellations in table E).

For the double stars only a selection is shown, limited to double stars that can be separated in small or medium-sized telescopes. As far as possible all plotted variable stars, open and globular clusters, planetary and diffuse nebulae, and galaxies are listed. All positions are for the epoch 2000.0.

In general visual (V) magnitudes are listed, except for the planetary nebulae, where the photographic magnitudes are given. Elsewhere, when a photographic magnitude is used, the figure is followed by 'p'.

When a colon follows an entry in the tables, it means that the given value is uncertain.

General

Con Constellation (the official IAU abbreviations: see table E, on page 35)
RA Right ascension
Dec Declination
NGC/IC Numbers from the *New General Catalogue* (NGC) or *Index Catalogues* (IC) by J.L.E. Dryer. NGC numbers have no prefix, IC numbers have the prefix I.

Variable stars

Range (max – min), type, period (days), and spectrum are given. In general only variable stars with a range of more than 0.5 magnitudes are plotted and listed.

Type Type of variable star
- **Cep** Classical Cepheid
- **CW** Type II Cepheid
- **E** Eclipsing binary
- **EA** Algol type
- **EB** Beta Lyrae type
- **EW** W Ursae Majoris type
- **M** Mira (long-period) type
- **SR** Semi-regular
- **Irr** Irregular
- **RCB** R Coronae Borealis type
- δ **Sct** Delta Scuti type
- **ZA** Z Andromedae type
- **Rn** Recurrent nova
- **N** Nova
- **RV** RV Tauri type
- **SD** S Dor type

Double stars

In general double stars with a separation less than 1 minute of arc, or with components fainter than magnitude 10.0, are not listed. When a magnitude entry is followed by 'd', it means that this component itself is also a double star.

PA Position angle, counter-clockwise from north (0°)
Sep Separation, in seconds of arc
The data are for the year 2000

Open clusters

Mag Integrated visual magnitude
Diam Diameter, in minutes of arc
N* Approximate number of stars

Globular clusters

Diam Diameter, in minutes of arc
Mag Integrated visual magnitude

Bright diffuse nebulae

Type Type of nebulae
- **E** Emission nebula
- **R** Reflection nebula

Diam Angular dimensions, in minutes of arc
Mag* Approximate magnitude of the illuminating star

Planetary nebulae

Diam Diameter, in seconds of arc
Two values separated by a slash (/) refer to a bright core surrounded by a fainter halo
Mag Integrated photographic magnitude
Mag* Photoelectric magnitude of the central star

Galaxies

Mag Integrated visual magnitude
Diam Major and minor diameters, in minutes of arc
Type Type of galaxy (see also figure 6 on page 37)
- **E** Elliptical galaxy
  The letter E is usually followed by a number ranging from 0 (almost circular) to 7 (flattened to a lens-shape)
- **Sa** Spiral galaxy with tightly wound arms
- **Sb** Spiral galaxy with less tight arms
- **Sc** Spiral galaxy with loosely wound arms
- **SBa** Barred spiral galaxy with tightly wound spiral arms
- **SBb** Barred spiral galaxy with less tight arms
- **SBc** Barred spiral galaxy with loosely wound arms
- **Irr** Irregular galaxy

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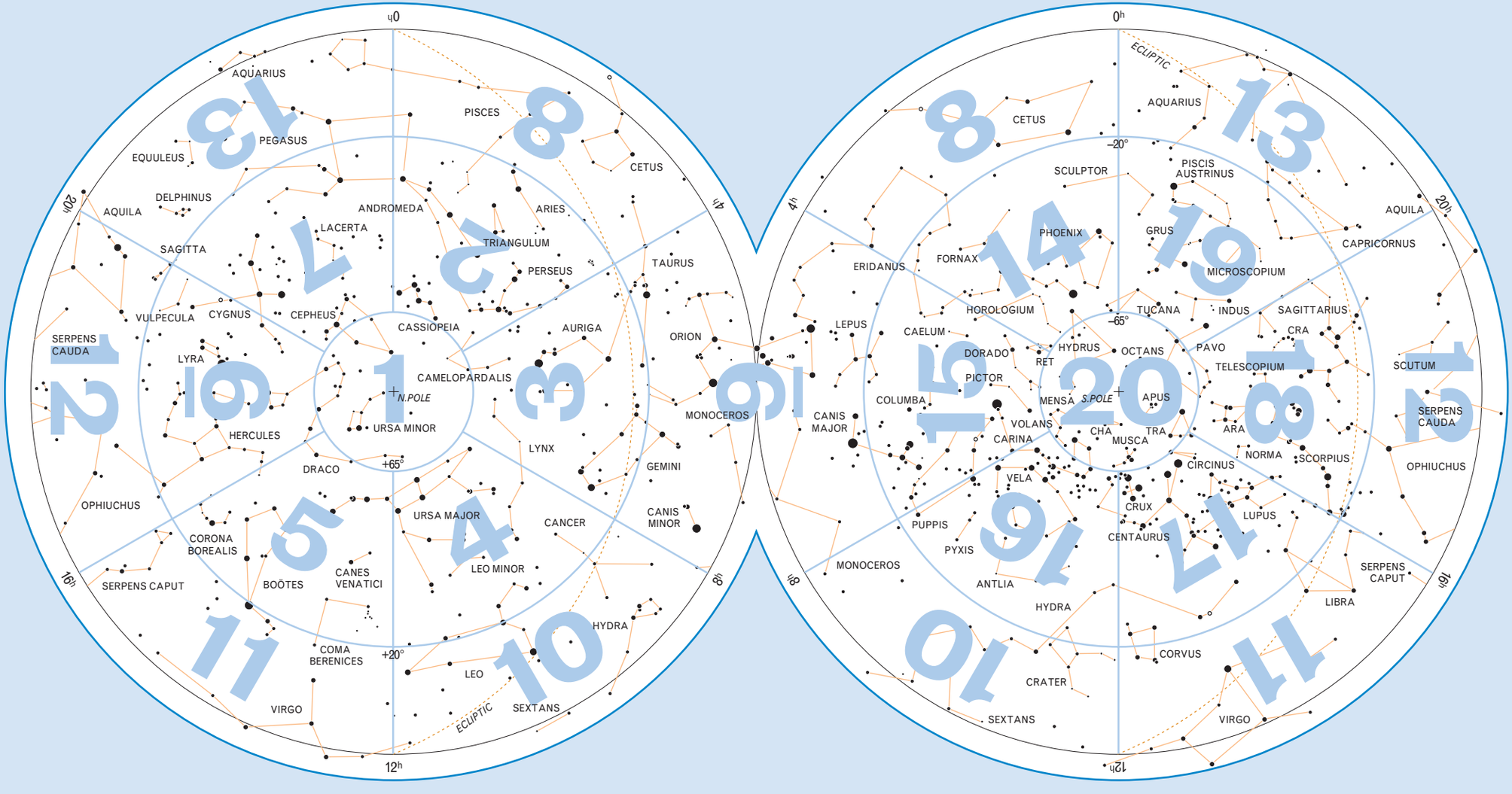
INDEX TO THE STAR CHARTS



Northern hemisphere **Southern hemisphere**

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Chart 1 *North of declination +65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
YZ	Cas	00 45.7	+74 59	5.7–6.1	EA	4.47	A + F
RZ	Cas	02 48.9	+69 38	6.2–7.7	EA	1.20	A
R	UMa	10 44.6	+68 47	6.7–13.4	M	301.7	M
VY	UMa	10 45.1	+67 25	5.9–6.5	Irr	—	M
RY	Dra	12 56.4	+66 00	6.0–8.0	SR	172.5:	K
RR	UMi	14 57.6	+65 56	6.1–6.5 p	SR	40:	M
UX	Dra	19 21.6	+76 34	5.9–7.1	SR	168:	C

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
ψ	Cas	01 25.9	+68 08	025	33.4	4.7 + 9.6	
48	Cas	02 02.0	+70 54	263	0.9	4.7 + 6.4	Binary, 60.4 years
ι	Cas	02 29.1	+67 24	230	2.5	4.6 + 6.9	Binary, 840 years
				114	7.2	8.4	
α	UMi	02 31.8	+89 16	218	18.4	2.0 + 9.0	Polaris
ψ	Dra	17 41.9	+72 09	015	30.3	4.9 + 6.1	
40, 41	Dra	18 00.2	+80 00	232	19.3	5.7 + 6.1	
ε	Dra	19 48.2	+70 16	015	3.1	3.8 + 7.4	
κ	Cep	20 08.9	+77 43	122	7.4	4.4 + 8.4	
β	Cep	21 28.7	+70 34	249	13.3	3.2 + 7.9	Alfirk
π	Cep	23 07.9	+75 23	357	1.2	4.6 + 6.6	Binary, 147 years
ο	Cep	23 18.6	+68 07	223	2.8	4.9 + 7.1	Binary, 796.2 years

Open cluster

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*
188		Cep	00 44.4	+85 20	8.1	14	120

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*
7822		Cep	00 03.6	+68 37	E	60 × 30	
—	Ced 214	Cep	00 04.7	+67 10	E + R	50 × 40	5.7
7023		Cep	21 01.8	+68 12	R	18 × 18	6.8

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
40		Cep	00 13.0	+72 32	10.7	37	11.6
I.3568		Cam	12 32.9	+82 33	11.6	6	12.3
6543		Dra	17 58.6	+66 38	8.8	18/350	11.4

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
I.342		Cam	03 46.8	+68 06	9.1	17.8 × 17.4	Sc	
I.356		Cam	04 07.8	+69 49	11.4	5.2 × 4.1	Sb	
1560		Cam	04 32.8	+71 53	11.5	9.8 × 2.0	Sd	
1961		Cam	05 42.1	+69 23	11.1	4.3 × 3.0	Sb	
2146		Cam	06 18.7	+78 21	10.5	6.0 × 3.8	SBb	
2336		Cam	07 27.1	+80 11	10.5	6.9 × 4.0	Sb	
2366		Cam	07 28.9	+69 13	10.9	7.6 × 3.5	Irr	
2403		Cam	07 36.9	+65 36	8.4	17.8 × 11.0	Sc	
—	U4305	UMa	08 18.9	+70 43	10.6	7.6 × 6.2	Irr	
2655		Cam	08 55.6	+78 13	10.1	5.1 × 4.1	SBa	
2715		Cam	09 08.1	+78 05	11.4	5.0 × 1.9	Sc	
2787		UMa	09 19.3	+69 12	10.8	3.4 × 2.3	Sa	
2976		UMa	09 47.3	+67 55	10.2	4.9 × 2.5	Sc	
2985		UMa	09 50.4	+72 17	10.5	4.3 × 3.4	Sb	
3031	M81	UMa	09 55.6	+69 04	6.9	25.7 × 14.1	Sb	Bode's Galaxy
3034	M82	UMa	09 55.8	+69 41	8.4	11.2 × 4.6	Pec	Cigar Galaxy
3077		UMa	10 03.3	+68 44	9.9	4.6 × 3.6	E2	
3147		Dra	10 16.9	+73 24	10.7	4.0 × 3.5	Sb	
I.2574		UMa	10 28.4	+68 25	10.6	12.3 × 5.9	S	
3348		UMa	10 47.2	+72 50	11.2	2.2 × 2.2	E1	
4125		Dra	12 08.1	+65 11	9.8	5.1 × 3.2	E5	
4236		Dra	12 16.7	+69 28	9.7	18.6 × 6.9	SB	
4589		Dra	12 37.4	+74 12	11.8	3.0 × 2.7	Sa	
4750		Dra	12 50.1	+72 52	11.9	2.3 × 2.1	Sa	
6503		Dra	17 49.4	+70 09	10.2	6.2 × 2.3	Sb	

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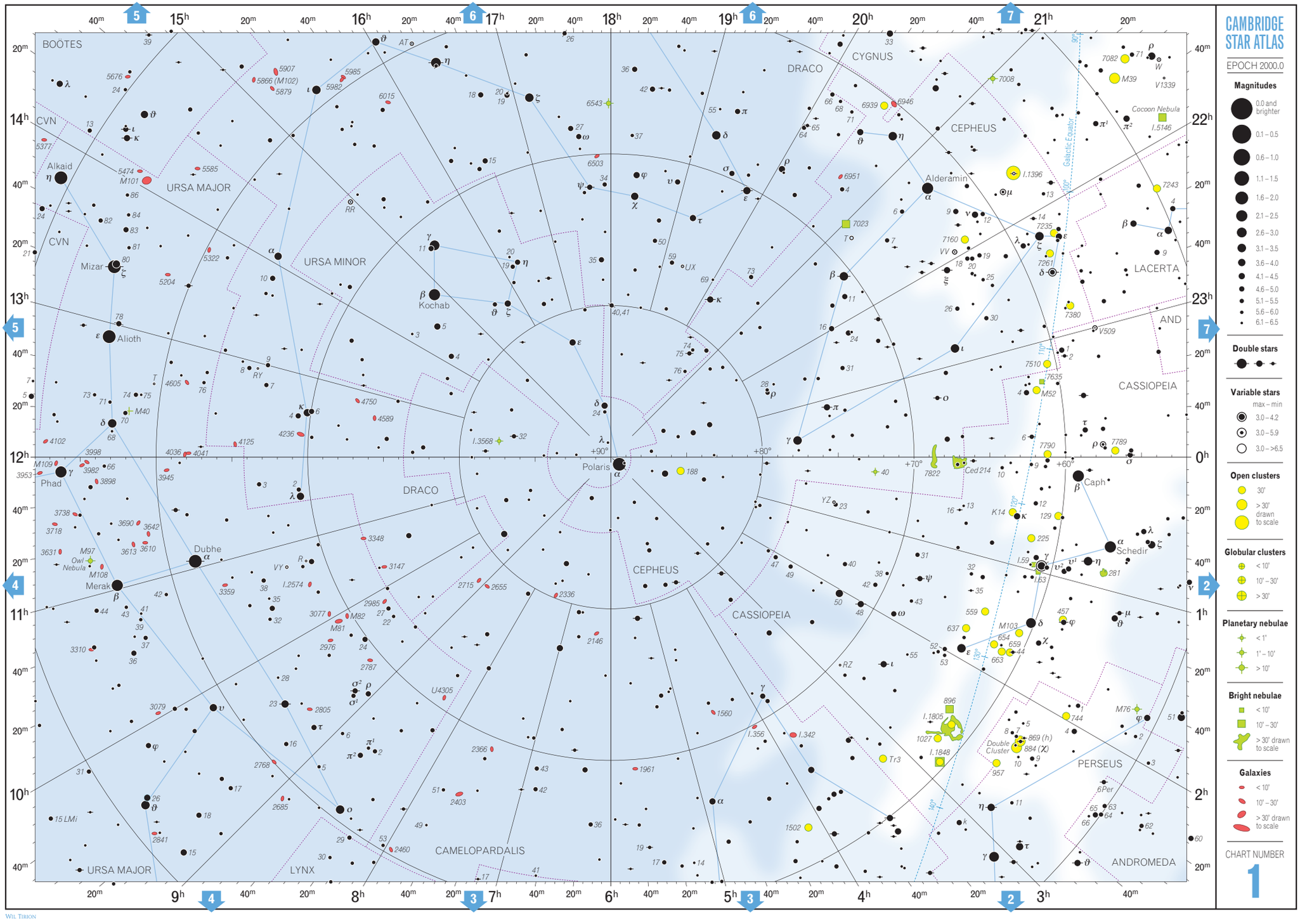

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

0.0 and brighter
0.1 – 0.5
0.6 – 1.0
1.1 – 1.5
1.6 – 2.0
2.1 – 2.5
2.6 – 3.0
3.1 – 3.5
3.6 – 4.0
4.1 – 4.5
4.6 – 5.0
5.1 – 5.5
5.6 – 6.0
6.1 – 6.5

Double stars

Variable stars

max – min
3.0 – 4.2
3.0 – 5.9
3.0 – >6.5

Open clusters

30'
> 30' drawn to scale

Globular clusters

< 10'
10' – 30'
> 30'

Planetary nebulae

< 1'
1' – 10'
> 10'

Bright nebulae

< 10'
10' – 30'
> 30' drawn to scale

Galaxies

< 10'
10' – 30'
> 30' drawn to scale

CHART NUMBER

1

Wil Tirion

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Chart 2 *RA 0h to 4h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
R	And	00 24.0	+38 35	5.8–14.9	M	409.3	M
γ	Cas	00 56.7	+60 43	1.6–3.0	Irr	—	B
R	Tri	02 37.0	+34 16	5.4–12.6	M	266.5	M
ρ	Per	03 05.2	+38 50	3.3–4.0	EA	50:	M
β	Per	03 08.2	+40 57	2.1–3.4	EA	2.87	B + G Algol
X	Per	03 55.4	+31 03	6.1–7.0	Irr	—	O

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
π	And	00 36.9	+33 43	173	35.9	4.4 + 8.6	
η	Cas	00 49.1	+57 49	317	12.9	3.4 + 7.5	Binary, 480 years
γ	Cas	00 56.7	+60 43	248	2.1	1.6 v + 11.2	Variable
ψ¹	Psc	01 05.6	+21 28	159	30.0	5.6 + 5.8	
35	Cas	01 21.1	+64 40	344	55.5	6.3 + 8.7	
γ	And	02 03.9	+42 20	63	9.8	2.3 + 5.1 d	Almaak
				103	0.4	5.5 + 6.3	Binary, 61.1 years
6	Tri	02 12.4	+30 18	71	3.9	5.3 + 6.9	= ε Tri
30	Ari	02 37.0	+24 39	274	38.6	6.6 + 7.4	
33	Ari	02 40.7	+27 04	0	28.6	5.5 + 8.4	
ε	Ari	02 59.2	+21 20	203	1.4	5.2 + 5.5	
ϑ	Per	02 44.2	+49 14	305	20.0	4.1 + 9.9	Binary, 2720 years
η	Per	02 50.7	+55 54	300	28.3	3.8 + 8.5	
				268	66.6	9.8	
40	Per	03 42.4	+33 58	238	20.0	5.0 + 9.5	
ο	Per	03 44.3	+32 17	37	10	3.8 + 8.3	
ζ	Per	03 54.1	+31 53	208	12.9	2.9 + 9.5	Atik
				286	32.8	11.3	
				195	94.2	9.5	
				185	120.3	10.2	
ε	Per	03 57.9	+40 01	10	8.8	2.9 + 8.1	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
129		Cas	00 29.9	+60 14	6.5	21	35	
—	K14	Cas	00 31.9	+63 10	8.5	7	20	
225		Cas	00 43.4	+61 47	7.0	12	15	
457		Cas	01 19.1	+58 20	6.4	13	80	
559		Cas	01 29.5	+63 18	9.5	4.4	60	
581	M103	Cas	01 33.2	+60 42	7.4	6	25	
637		Cas	01 42.9	+64 00	8.2	3.5	20	
654		Cas	01 44.1	+61 53	6.5	5	60	
659		Cas	01 44.2	+60 42	7.9	5	40	
663		Cas	01 46.0	+61 15	7.1	16	80	
752		And	01 57.8	+37 41	5.7	50	60	
744		Per	01 58.4	+55 29	7.9	11	20	
869	h	Per	02 19.0	+57 09	4.3 p	30	200	Double Cluster
884	χ	Per	02 22.4	+57 07	4.4 p	30	150	Double Cluster

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
I.1805		Cas	02 32.7	+61 27	6.5	22	40	In nebula
957		Per	02 33.6	+57 32	7.6	11	30	
1039	M34	Per	02 42.0	+42 47	5.2	35	60	
1027		Cas	02 42.7	+61 33	6.7	20	40	
I.1848		Cas	02 51.2	+60 26	6.5	12	10	
—	Tr 3	Cas	03 11.8	+63 15	7.0 p	23	30	
1245		Per	03 14.7	+47 15	8.4	10	200	
1342		Per	03 31.6	+37 20	6.7	14	40	
—	M45	Tau	03 47.0	+24 07	1.2	110	100	Pleiades
1444		Per	03 49.4	+52 40	6.6	4.0		

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
281		Cas	00 52.8	+56 36	E	35 × 30	7.8	
I.59		Cas	00 56.7	+61 04	E + R	10 × 5	2.5	γ Cas
I.63		Cas	00 59.5	+60 49	E + R	10 × 3	2.5	γ Cas
896		Cas	02 24.8	+61 54	E	27 × 13	10.5	
I.1805		Cas	02 33.4	+61 26	E	60 × 60		
I.1848		Cas	02 51.3	+60 25	E	60 × 30		

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
650, 651	M76	Per	01 42.4	+51 34	12.2	65/290	17.0:	Little Dumbbell

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
23		Peg	00 09.9	+25 55	11.9	2.3 × 1.6	Sc	
147		Cas	00 33.2	+48 30	9.3	12.9 × 8.1	dE4	
185		Cas	00 39.0	+48 20	9.2	11.5 × 9.8	dE0	
205	M110	And	00 40.4	+41 41	8.0	17.4 × 9.8	E6	Companion to M31
221	M32	And	00 42.7	+40 52	8.2	7.6 × 5.8	E2	Companion to M31
224	M31	And	00 42.7	+41 16	3.5	178 × 63	Sb	Andromeda Galaxy
278		Cas	00 52.1	+47 33	10.9	2.2 × 2.1	E0	
404		And	01 09.4	+35 43	10.1	4.4 × 4.2	E0	Appr. 6.5′ NW of β And
598	M33	Tri	01 33.9	+30 39	5.7	62 × 39	Sc	Triangulum Galaxy
I.1727		Tri	01 47.5	+27 20	11.6	6.2 × 2.9	SB	
672		Tri	01 47.9	+27 26	10.8	6.6 × 2.7	SBc	
784		Tri	02 01.3	+28 50	11.8	6.2 × 1.7	SB	
891		And	02 22.6	+42 21	10.0	13.5 × 2.8	Sb	
925		Tri	02 27.3	+33 35	10.0	9.8 × 6.0	SBc	
I.239		And	02 36.5	+38 58	11.2	4.6 × 4.3	SBc	
1003		Per	02 39.3	+40 52	11.5	5.4 × 2.1	Sc	
1023		Per	02 40.4	+39 04	9.5	8.7 × 3.3	E7	

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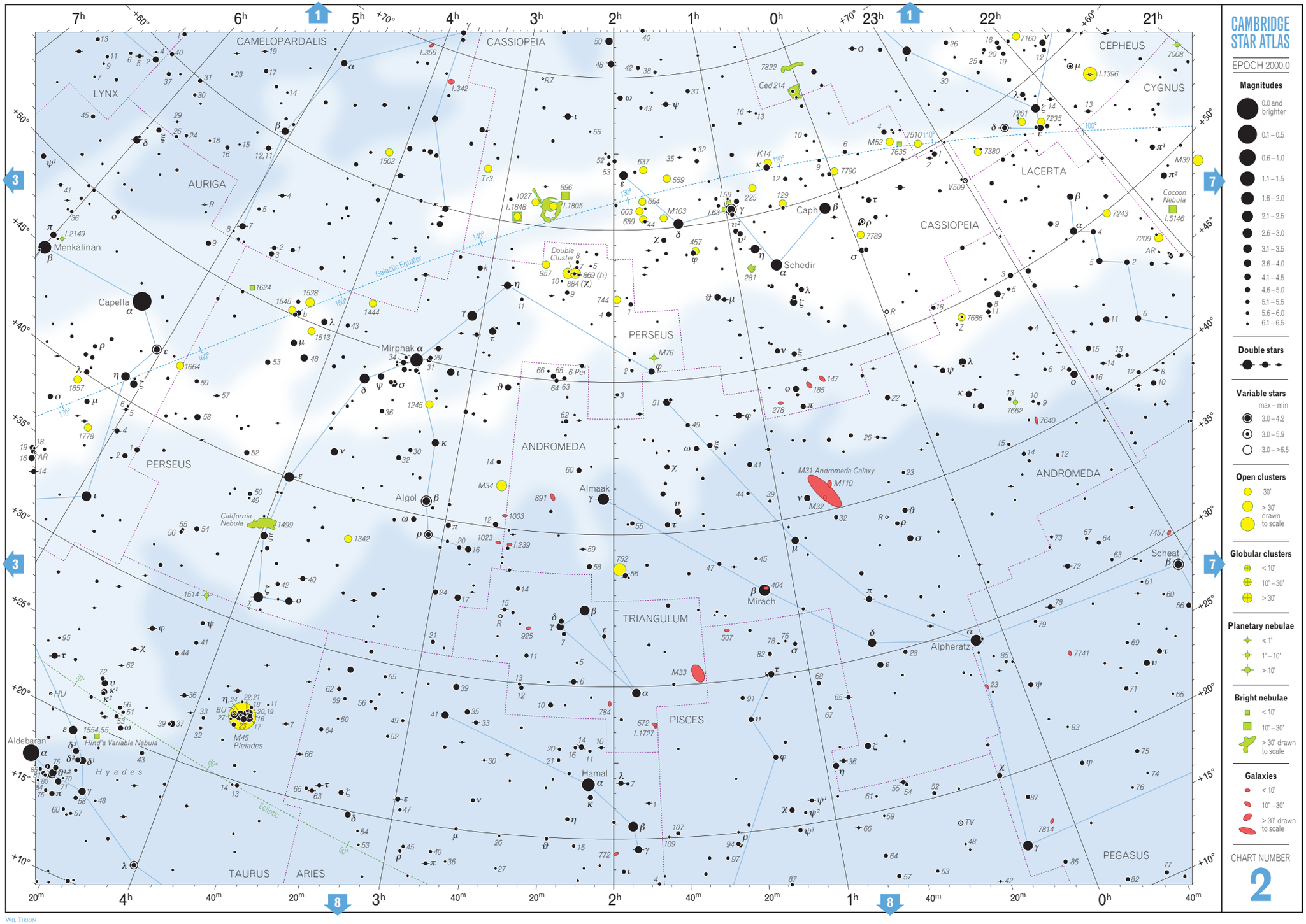

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

2

Wil Tirion

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Chart 3 *RA 4h to 8h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
HU	Tau	04 38.3	+20 41	5.9–6.7	EA	2.06	A
ε	Aur	05 02.0	+43 49	2.9–3.8	EA	9892	A – F
R	Aur	05 17.3	+53 35	6.7–13.7	M	457.5	M
AR	Aur	05 18.3	+33 46	6.2–6.8	EA	4.13	A + B
U	Ori	05 55.8	+20 10	4.8–12.6	M	372.4	M
TV	Gem	06 11.8	+21 52	8.7–9.5 p	SR	182	M
BU	Gem	06 12.3	+22 54	5.7–7.5	Irr	—	M
η	Gem	06 14.9	+22 30	3.2–3.9	SR	232.9	M Propus
RT	Aur	06 28.6	+30 30	5.0–5.8	Cep	3.72	F – G
WW	Aur	06 32.5	+32 27	5.8–6.5	EA	2.53	A
UU	Aur	06 36.5	+38 27	7.8–10.0	SR	234	C
ζ	Gem	07 04.1	+20 34	3.7–4.2	Cep	10.15	F – G Mekbuda
R	Gem	07 07.4	+22 42	6.0–14.0	M	369.8	S

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
φ	Tau	04 20.4	+27 21	250	52.1	5.0 + 8.0	
χ	Tau	04 22.6	+25 38	24	19.4	5.5 + 7.6	
56	Per	04 24.6	+33 58	22	4.2	5.9 + 8.7	
κ^1, κ^2	Tau	04 25.4	+22 18	173	339	4.2 + 5.3	
4	Aur	04 59.3	+37 53	359	5.4	5.0 + 8.0	
14	Aur	05 15.4	+32 41	352	11.1	5.1 + 11.1	
				226	14.6	7.4	
				321	184.0	10.4	
R	Aur	05 17.3	+53 35	339	47.5	6.9 v + 8.6	Variable
118	Tau	05 29.3	+25 09	204	4.8	5.8 + 6.6	
26	Aur	05 38.6	+30 30	3	0.2	6.0 + 6.3	Binary, 53.2 years
				267	12.4	8.0	
ν	Aur	05 51.5	+39 09	206	54.6	4.0 + 9.3	
δ	Aur	05 59.5	+54 17	271	115.4	3.7 + 9.5	
				67	197.1	9.5	
ϑ	Aur	05 59.7	+37 13	313	3.6	2.6 + 7.1	
				297	50.0	10.6	
η	Gem	06 14.9	+22 30	257	1.6	3.3 v + 8.8	Propus; var.; bin., 473.7 y.
μ	Gem	06 22.9	+22 31	141	121.7	3.2 + 9.4	
ν	Gem	06 29.0	+20 13	329	112.5	4.2 + 8.7	
ε	Gem	06 43.9	+25 08	94	110.3	3.0 + 9.0	Mebsuta
12	Lyn	06 46.2	+59 27	70	1.7	5.4 + 6.0	Binary, 699 years
				308	8.7	7.3	
ζ	Gem	07 04.1	+20 34	84	87.0	3.7 v + 10.5	Variable
				350	96.5	8.0	
δ	Gem	07 20.1	+21 59	226	5.8	3.5 + 8.2	Wasat; binary, 1,200 years
19	Lyn	07 22.9	+55 17	315	14.8	5.6 + 6.5	
				3	214.9	8.9	
α	Gem	07 34.6	+31 53	68	4.0	1.9 + 2.9	Castor; binary, 420 years
				163	72.5	8.8	
24	Lyn	07 43.0	+58 43	320	54.7	5.0 + 9.5	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
1502		Cam	04 07.7	+62 20	5.7	8	45	
1513		Per	04 10.0	+49 31	8.4	9	50	
1528		Per	04 15.4	+51 14	6.4	24	40	
1545		Per	04 20.9	+50 15	6.2	18	20	
1664		Aur	04 51.1	+43 42	7.6	18		
1746		Tau	05 03.6	+23 49	6.1	42	20	
1778		Aur	05 08.1	+37 03	7.7	7	25	
1857		Aur	05 20.2	+39 21	7.0	6	40	
1893		Aur	05 22.7	+33 24	7.5	11	60	
1907		Aur	05 28.0	+35 19	8.2	7	30	
1912	M38	Aur	05 28.7	+35 50	6.4	21	100	
1960	M36	Aur	05 36.1	+34 08	6.0	12	60	
2099	M37	Aur	05 52.4	+32 33	5.6	24	150	
2129		Gem	06 01.0	+23 18	6.7	7	40	
I.2157		Gem	06 05.0	+24 00	8.4	7	20	
2158		Gem	06 07.5	+24 06	8.6	5		
2168	M35	Gem	06 08.9	+24 20	5.1	28	200	
2175		Ori	06 09.8	+20 19	6.8	18	60	In nebula 2174
2281		Aur	06 49.3	+41 04	5.4	15	30	
2331		Gem	07 07.2	+27 21	8.5	18	30	
2420		Gem	07 38.5	+21 34	8.3	10	100	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
2419		Lyn	07 38.1	+38 53	10.4	4.1

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
1499		Per	04 00.7	+36 37	E	145 × 40	4.0	California Nebula
1624		Per	04 40.5	+50 27	E	5 × 5		
1931		Aur	05 31.4	+34 15	E + R	3 × 3		
1952	M1	Tau	05 34.5	+22 01	E	6 × 4	16	Crab Nebula; SNR
2174		Gem	06 09.7	+20 30	E	40 × 30	7.6	Contains cluster 2175
I.443		Gem	06 16.9	+22 47	E	50 × 40	8.8	Supernova remnant

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
1514		Tau	04 09.2	+30 47	10.0	114	9.4	
2392		Gem	07 29.2	+20 55	9.9	13/44	10.5	Eskimo Nebula

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
2460		Cam	07 56.9	+60 21	11.7	2.9 × 2.2	Sb

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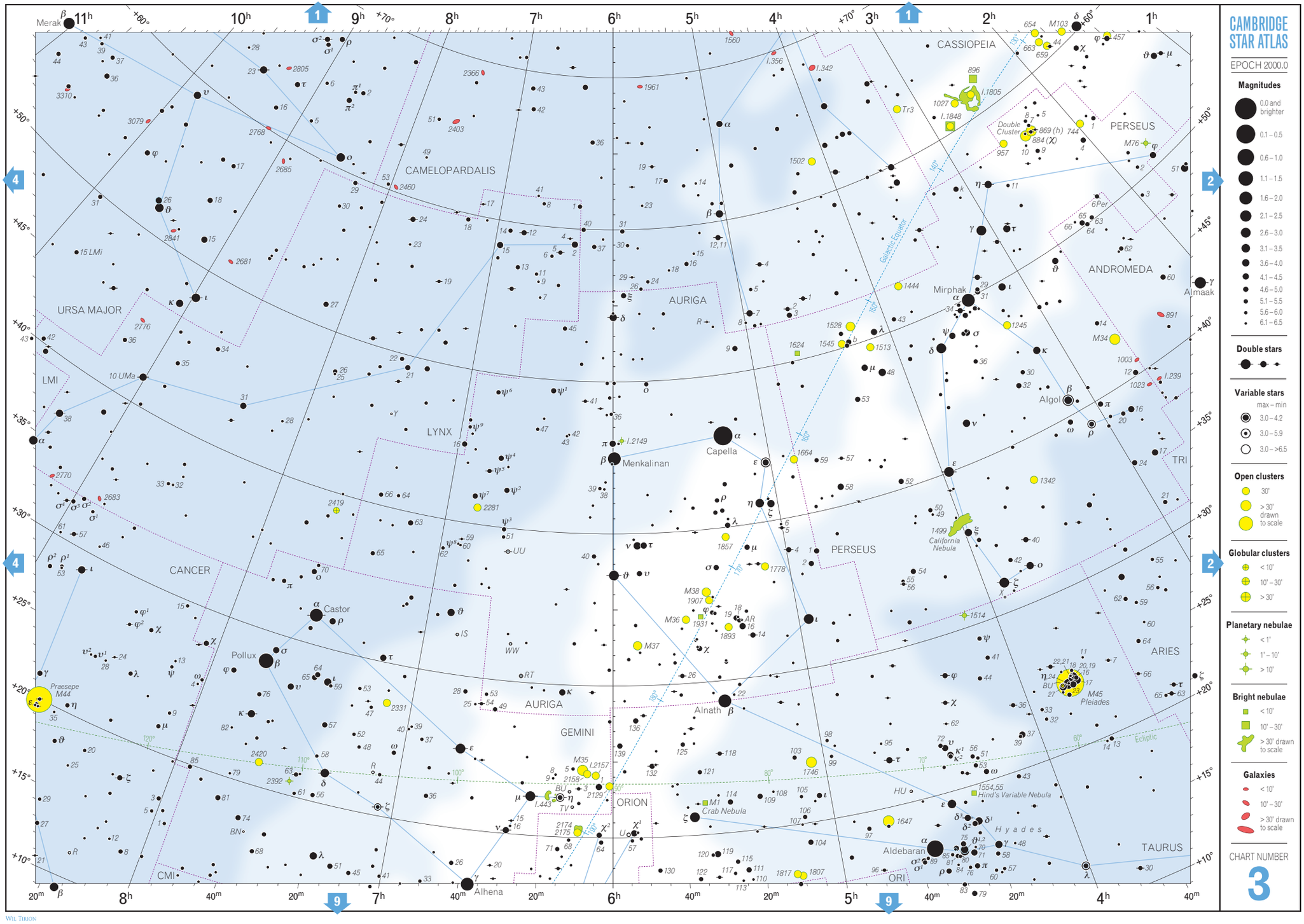

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

3

Wil Tirion

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Chart 4 *RA 8h to 12h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
RS	Cnc	09 10.6	+30 58	5.1–7.0	SR	120:	M
R	LMi	09 45.6	+34 31	6.3–13.2	M	371.9	M
ST	UMa	11 27.8	+45 11	7.7–9.5	SR	81	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
ι	Cnc	08 46.7	+28 46	307	30.5	4.2 + 6.6	
ι	UMa	08 59.2	+48 02	177	2.0	3.1 + 10.2	Talitha; binary, 817.9 years
38	Lyn	09 18.8	+36 48	229	2.7	3.9 + 6.6	
23	UMa	09 31.5	+63 04	270	22.7	3.7 + 8.9	
54	Leo	10 55.6	+24 45	110	6.5	4.5 + 6.3	
α	UMa	11 03.7	+61 45	223	0.6	1.9 + 4.8	Dubhe; binary, 44.7 years
ξ	UMa	11 18.2	+31 32	273	1.8	4.3 + 4.8	Binary, 59.8 years
ν	UMa	11 18.5	+33 06	147	7.2	3.5 + 9.9	
57	UMa	11 29.1	+39 20	359	5.4	5.3 + 8.3	

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
3587	M97	UMa	11 14.8	+55 01	12.0	194	15.9	Owl Nebula

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
2683		Lyn	08 52.7	+33 25	9.7	9.3 × 2.5	Sb
2681		UMa	08 53.5	+51 19	10.3	3.8 × 3.5	Sa
2685		UMa	08 55.6	+58 44	11.1	5.2 × 3.0	Sb
2770		Lyn	09 09.6	+33 07	12.1	3.7 × 1.3	Sc
2768		UMa	09 11.6	+60 02	10.0	6.3 × 2.8	E5
2776		Lyn	09 12.2	+44 57	11.6	2.9 × 2.7	Sc
2805		UMa	09 20.3	+64 06	11.3	6.3 × 5.0	SBd
2841		UMa	09 22.0	+50 58	9.3	8.1 × 3.8	Sb
2903		Leo	09 32.2	+21 30	8.9	12.6 × 6.6	Sb
3079		UMa	10 02.0	+55 41	10.7	7.6 × 1.7	Sb
3190		Leo	10 18.1	+21 50	11.0	4.6 × 1.8	Sb
3184		UMa	10 18.3	+41 25	9.8	6.9 × 6.8	Sc

Galaxies *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
3193		Leo	10 18.4	+21 54	10.9	2.8 × 2.6	E0	
3198		UMa	10 19.9	+45 33	10.4	8.3 × 3.7	Sc	
3245		LMi	10 27.3	+28 30	10.8	3.2 × 1.9	E5	
3294		LMi	10 36.3	+37 20	11.7	3.3 × 1.8	Sc	
3310		UMa	10 38.7	+53 30	10.9	3.6 × 3.0	SBb	
3319		UMa	10 39.2	+41 41	11.3	6.8 × 3.9	SBc	
3344		LMi	10 43.5	+24 55	10.0	6.9 × 6.5	Sc	
3359		UMa	10 46.6	+63 13	10.5	6.8 × 4.3	SBc	
3430		LMi	10 52.2	+32 57	11.5	3.9 × 2.3	Sc	
3432		LMi	10 52.5	+36 37	11.3	6.2 × 1.5	SB	
3486		LMi	11 00.4	+28 58	10.3	6.9 × 5.4	Sc	
3504		LMi	11 03.2	+27 58	11.1	2.7 × 2.2	Sb	
3556	M108	UMa	11 11.5	+55 40	10.1	8.3 × 2.5	Sc	
—	U6253	Leo	11 13.5	+22 10	11.5	14.5 × 12.9	dE0	Leo II
3583		UMa	11 14.2	+48 19	11.7	2.8 × 2.0	Sc	
3610		UMa	11 18.4	+58 47	10.8	3.2 × 2.5	E2	
3613		UMa	11 18.6	+58 00	11.6	3.6 × 2.0	E5	
3631		UMa	11 21.0	+53 10	10.4	4.6 × 4.1	Sc	
3646		Leo	11 21.7	+20 10	11.2	3.9 × 2.6	Sc	
3642		UMa	11 22.3	+59 05	11.1	5.8 × 4.9	Sc	
3665		UMa	11 24.7	+38 46	10.8	3.2 × 2.6	E2	
3675		UMa	11 26.1	+43 35	10.9	5.9 × 3.2	Sb	
3690		UMa	11 28.5	+58 33	12.0	2.4 × 1.9	S	
3718		UMa	11 32.6	+53 04	10.5	8.7 × 4.5	SBa	
3726		UMa	11 33.3	+47 02	10.4	6.0 × 4.5	Sc	
3738		UMa	11 35.8	+54 31	11.7	2.6 × 2.0	Pec	
3769		UMa	11 37.7	+47 54	11.8	3.2 × 1.1	Sb	
3877		UMa	11 46.1	+47 30	11.6	5.4 × 1.5	Sb	
3893		UMa	11 48.6	+48 43	11.1	4.4 × 2.8	Sc	
3898		UMa	11 49.2	+56 05	10.8	4.4 × 2.6	Sb	
3941		UMa	11 52.9	+36 59	11.4	3.8 × 2.5	E3	
3945		UMa	11 53.2	+60 41	10.6	5.5 × 3.6	SBa	
3949		UMa	11 53.7	+47 52	11.0	3.0 × 1.8	Sb	
3953		UMa	11 53.8	+52 20	10.1	6.6 × 3.6	Sb	
3982		UMa	11 56.5	+55 08	11.7	2.5 × 2.2	Sb	
3992	M109	UMa	11 57.6	+53 23	9.8	7.6 × 4.9	SBb	
3998		UMa	11 57.9	+55 27	10.6	3.1 × 2.5	E2	
I.750		UMa	11 58.9	+42 43	11.8	2.9 × 1.4	Sb	
4026		UMa	11 59.4	+50 58	11.7	5.1 × 1.4	S0	

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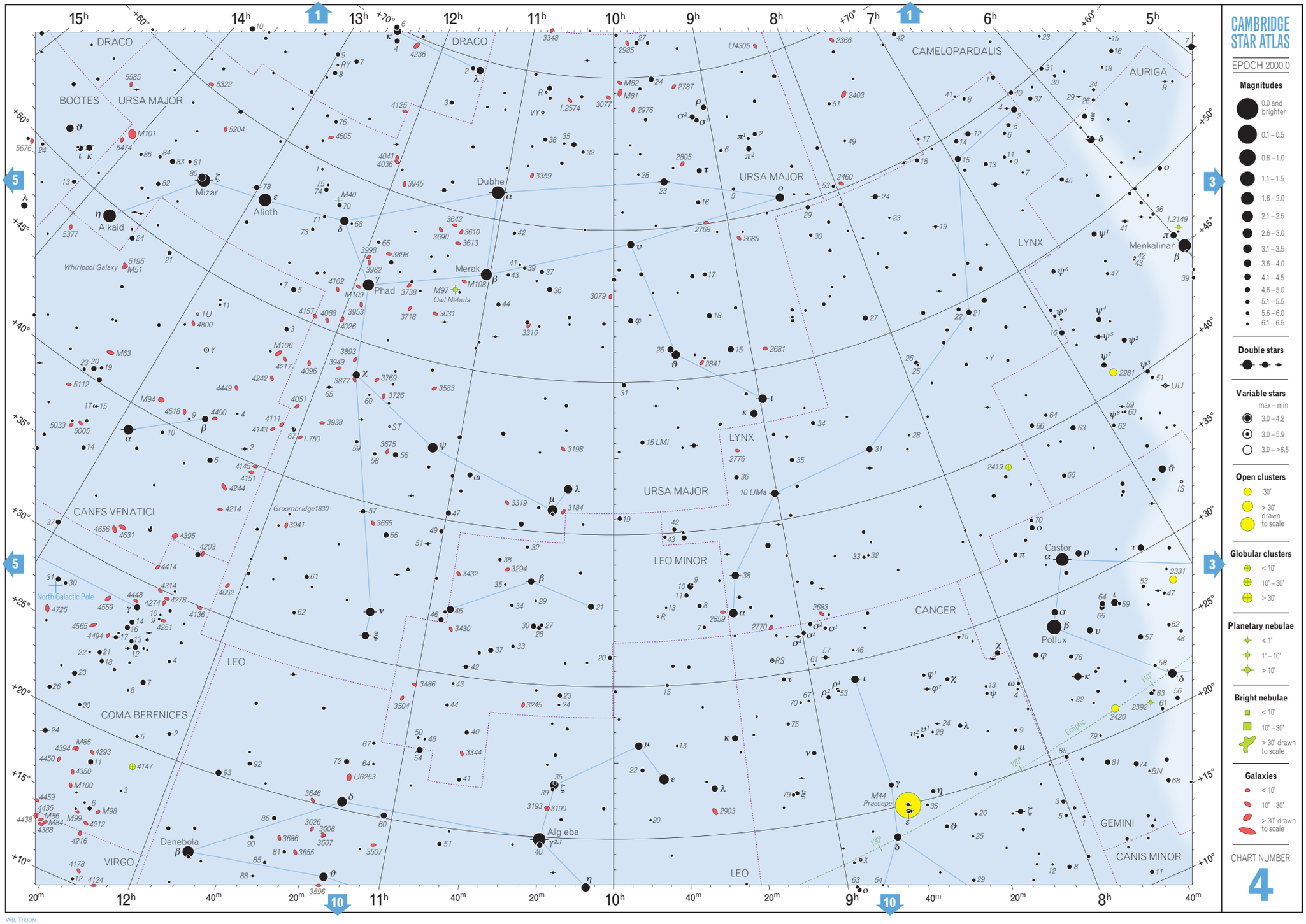

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

4

Wil Tirion

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Chart 5 *RA 12h to 16h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
T	UMa	12 36.4	+59 29	6.6–13.4	M	256.5	M
Y	CVn	12 45.1	+45 26	5.2–6.6	SR	257	K
TU	CVn	12 54.9	+47 12	5.6–6.6	SR	50	M
FS	Com	13 06.4	+22 37	5.3–6.1	SR	58:	M
R	CVn	13 49.0	+39 33	6.5–12.9	M	328.53	M
ZZ	Boo	13 56.2	+25 55	5.8–6.4	EW	4.99	G
V	Boo	14 29.8	+38 52	7.0–12.0	SR	258	M
R	Boo	14 37.2	+26 44	6.2–13.1	M	233.4	M
W	Boo	14 43.4	+26 32	4.7–5.4	SR	450:	M
44	Boo	15 03.8	+47 39	5.8–6.4	EW	0.27	G + G i Boo
S	CrB	15 21.4	+31 22	5.8–14.1	M	360.3	M
R	CrB	15 48.6	+28 09	5.7–14.8	RCB	—	G
T	CrB	15 59.5	+25 55	2.0–10.8	RN	29,000:	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
2	CVn	12 16.1	+40 40	260	11.4	5.8 + 8.1	
α	CVn	12 56.0	+38 19	229	19.4	2.9 + 5.5	Cor Caroli
78	UMa	13 00.7	+56 22	69	1.5	5.0 + 7.4	Binary, 115.7 years
ζ	UMa	13 23.9	+54 56	152	14.4	2.3 + 4.0	Mizar
				71	708.7	4.0	80 UMa, Alcor
κ	Boo	14 13.5	+51 47	236	13.4	4.6 + 6.6	
ε	Boo	14 45.0	+27 04	339	2.8	2.5 + 4.9	Izar
39	Boo	14 49.7	+48 43	45	2.9	6.2 + 6.9	
44	Boo	15 03.8	+47 39	53	2.2	5.3 + 6.2 v	Binary, 225 years; variable
η	CrB	15 23.2	+30 17	63	0.8	5.6 + 5.9	Binary, 41.6 years
μ^1, μ^2	Boo	15 24.5	+37 23	171	108.3	4.3 + 6.5 d	Alkalurops
μ^2	Boo	15 24.5	+37 21	8	2.3	7.0 + 7.6	Binary, 260.1 years

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
5272	M3	CVn	13 42.2	+28 23	6.4	16.2
5466		Boo	14 05.5	+28 32	9.1	11.0

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
4036		UMa	12 01.4	+61 54	10.6	4.5 × 2.0	E6
4041		UMa	12 02.2	+62 08	11.1	2.8 × 2.7	Sc
4051		UMa	12 03.2	+44 32	10.3	5.0 × 4.0	Sc
4062		UMa	12 04.1	+31 54	11.2	4.3 × 2.0	Sb
4088		UMa	12 05.6	+50 33	10.5	5.8 × 2.5	Sc
4096		UMa	12 06.0	+47 29	10.6	6.5 × 2.0	Sc
4102		UMa	12 06.4	+52 43	12.3	3.2 × 1.9	Sc
4111		CVn	12 07.1	+43 04	10.8	4.8 × 1.1	S0

Galaxies *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
4136		Com	12 09.3	+29 56	11.4	4.1 × 3.9	Sc	
4143		CVn	12 09.6	+42 32	12.1	2.9 × 1.8	E4	
4145		CVn	12 10.0	+39 53	11.0	5.8 × 4.4	Sc	
4151		CVn	12 10.5	+39 24	10.4	5.9 × 4.4	Pec	
4157		UMa	12 11.1	+50 29	11.7	6.9 × 1.7	Sb	
4214		CVn	12 15.6	+36 20	9.7	7.9 × 6.3	Irr	
4217		CVn	12 15.8	+47 06	11.9	5.5 × 1.8	Sb	
4242		CVn	12 17.5	+45 37	11.0	4.8 × 3.8	S	
4244		CVn	12 17.5	+37 49	10.2	16.2 × 2.5	S	
4251		Com	12 18.1	+28 10	11.6	4.2 × 1.9	E7	
4258	M106	CVn	12 19.0	+47 18	8.3	18.2 × 7.9	Sb	
4274		Com	12 19.8	+29 37	10.4	6.9 × 2.8	Sb	
4278		Com	12 20.1	+29 17	10.2	3.6 × 3.5	E1	
4314		Com	12 22.6	+29 53	10.5	4.8 × 4.3	SBa	
4395		CVn	12 25.8	+33 33	10.2	12.9 × 11.0	S	
4414		Com	12 26.4	+31 13	10.3	3.6 × 2.2	Sc	
4448		Com	12 28.2	+28 37	11.1	4.0 × 1.6	Sb	
4449		CVn	12 28.2	+44 06	9.4	5.1 × 3.7	Irr	
4490		Com	12 30.6	+41 38	9.8	5.9 × 3.1	Sc	
4494		Com	12 31.4	+25 47	9.7	4.8 × 3.8	E1	
4559		Com	12 36.0	+27 58	9.9	10.5 × 4.9	Sc	
4565		Com	12 36.3	+25 59	9.6	16.2 × 2.8	SBc	
4605		UMa	12 40.0	+61 37	11.0	5.5 × 2.3	Sc	
4618		CVn	12 41.5	+41 09	10.8	4.4 × 3.8	Sc	
4631		CVn	12 42.1	+32 32	9.3	15.1 × 3.3	Sc	
4656		CVn	12 44.0	+32 10	10.4	13.8 × 3.3	Sc	
4725		Com	12 50.4	+25 30	9.2	11.0 × 7.9	SBb	
4736	M94	CVn	12 50.9	+41 07	8.2	11.0 × 9.1	Sb	
4800		CVn	12 54.6	+46 32	12.3	1.8 × 1.4	Sb	
4826	M64	Com	12 56.7	+21 41	8.5	9.3 × 5.4	Sb	Black-Eye Galaxy
5005		CVn	13 10.9	+37 03	9.8	5.4 × 2.7	Sb	
5033		CVn	13 13.4	+36 36	10.1	10.5 × 5.6	Sb	
5055	M63	CVn	13 15.8	+42 02	8.6	12.3 × 7.6	Sb	Sunflower Galaxy
5112		CVn	13 21.9	+38 44	11.9	3.9 × 2.9	Sc	
5204		UMa	13 29.6	+58 25	11.3	4.8 × 3.0	Irr	
5194	M51	CVn	13 29.9	+47 12	8.4	11.0 × 7.8	Sc	Whirlpool Galaxy
5195		CVn	13 30.0	+47 16	9.6	5.4 × 4.3	Pec	Companion of M51
5322		UMa	13 49.3	+60 12	10.0	5.5 × 3.9	E2	
5371		CVn	13 55.7	+40 28	10.8	4.4 × 3.6	Sb	
5377		CVn	13 56.3	+47 14	11.2	4.6 × 2.7	Sa	
5457	M101	UMa	14 03.2	+54 21	7.7	26.9 × 26.3	Sc	Pinwheel Galaxy
5474		UMa	14 05.0	+53 40	10.9	4.5 × 4.2	Sc	
5585		UMa	14 19.8	+56 44	10.9	5.5 × 3.7	S	
5676		Boo	14 32.8	+49 28	10.9	3.9 × 2.0	Sc	
5866	(M102)	Dra	15 06.5	+55 46	10.0	5.2 × 2.3	E6	Spindle Galaxy
5879		Dra	15 09.8	+57 00	11.5	4.4 × 1.7	Sb	
5907		Dra	15 15.9	+56 19	10.4	12.3 × 1.8	Sb	
5982		Dra	15 38.7	+59 21	11.1	2.9 × 2.2	E3	
5985		Dra	15 39.6	+59 20	11.0	5.5 × 3.2	Sb	
6015		Dra	15 51.4	+62 19	11.2	5.4 × 2.3	Sc	

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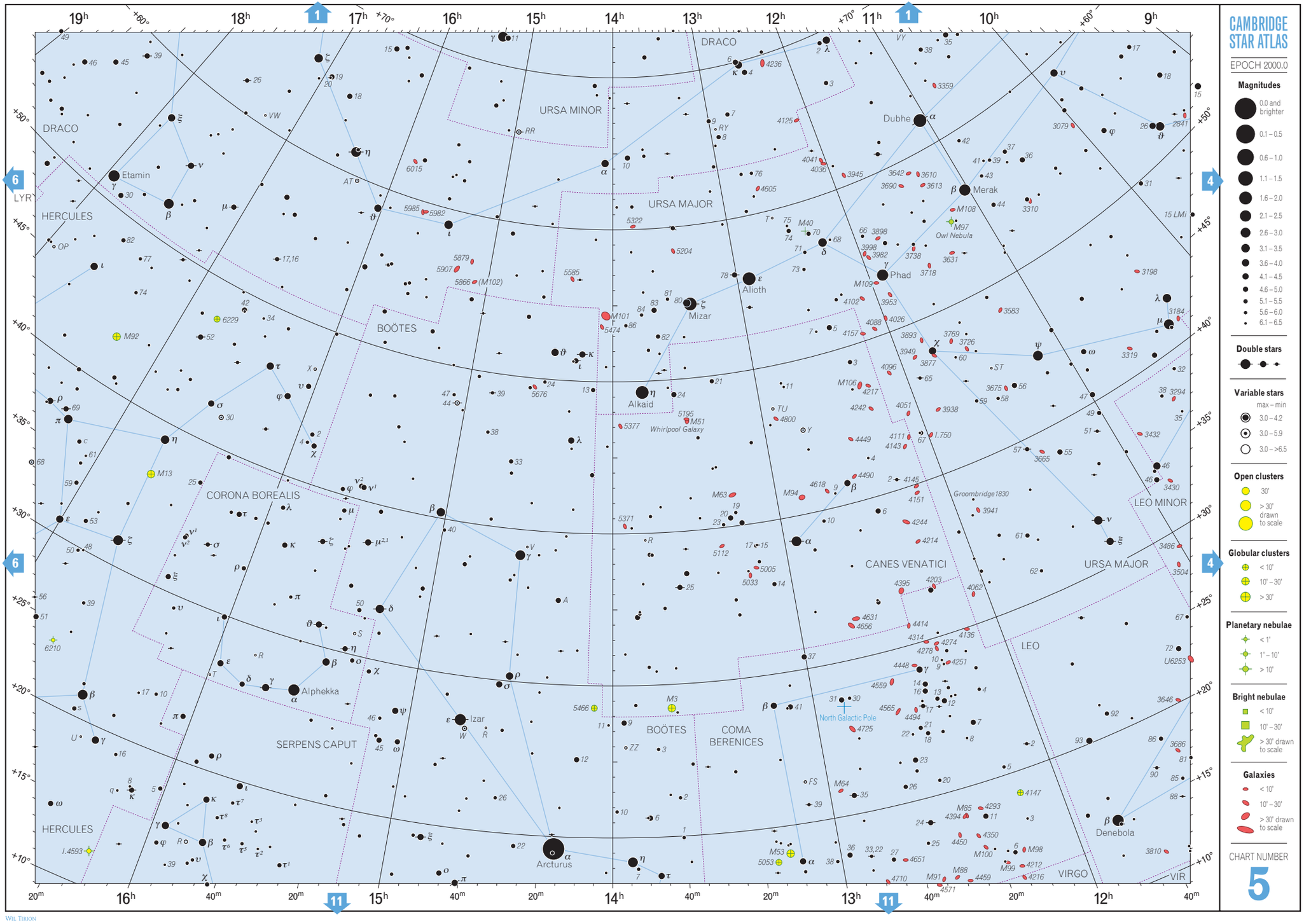

Wil Tirion

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Chart 6 *RA 16h to 20h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum	
X	Her	16 02.7	+47 14	6.3–7.4	SR	95.0	M	
AT	Dra	16 17.3	+59 45	5.3–6.0	Irr	—	M	
30	Her	16 28.6	+41 53	4.3–6.3	SR	70:	M	g Her
VW	Dra	17 16.5	+60 40	6.0–6.5	SR	170:	K	
68	Her	17 17.3	+33 06	4.7–5.4	EB	2.05	B	u Her
OP	Her	17 56.8	+45 21	5.9–6.7	Irr	—	M	
XY	Lyr	18 38.1	+39 40	5.8–6.4	Irr	—	M	
β	Lyr	18 50.1	+33 22	3.3–4.3	EB	12.94	B + A	Sheliak
R	Lyr	18 55.3	+43 57	3.9–5.0	SR	46.0	M	
AF	Cyg	19 30.2	+46 09	6.4–8.4	SR	94.1	M	
U	Vul	19 36.6	+20 20	6.8–7.5	Cep	7.99	F – G	
R	Cyg	19 36.8	+50 12	6.1–14.2	M	426.4	S	
V1143	Cyg	19 38.7	+54 58	5.9–6.4	EA	7.64	F	
RT	Cyg	19 43.6	+48 47	6.4–12.7	M	190.3	M	
V973	Cyg	19 44.8	+40 43	6.1–6.6	SR	40:	M	
SU	Cyg	19 44.8	+29 16	6.5–7.2	Cep	3.85	F	
χ	Cyg	19 50.6	+32 55	3.3–14.2	M	406.9	S	
V449	Cyg	19 53.3	+33 57	7.4–9.0 p	Irr	—	M	

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
η	Dra	16 24.0	+61 31	142	5.2	2.7 + 8.7	
17	Dra	16 36.2	+52 55	108	3.4	5.4 + 6.4	
				194	90.3	5.5	16 Dra
ζ	Her	16 41.3	+31 36	12	0.8	2.9 + 5.5	Binary, 34.5 years
μ	Dra	17 05.3	+54 28	8	1.9	5.7 + 5.7	Binary, 482 years
ρ	Her	17 23.7	+37 09	316	4.1	4.6 + 5.6	
ν	Dra	17 32.2	+55 11	312	61.9	4.9 + 4.9	
μ	Her	17 46.5	+27 43	247	33.8	3.4 + 10.1	
90	Her	17 53.3	+40 00	116	1.6	5.2 + 8.5	
95	Her	18 01.5	+21 36	258	6.3	5.0 + 5.1	
100	Her	18 07.8	+26 06	183	14.2	5.9 + 6.0	
39	Dra	18 23.9	+58 48	351	3.1	5.0 + 8.0	
				21	88.9	7.4	5 other fainter components
ε	Lyr	18 44.3	+39 40	207.7	173	4.7 + 4.6	ε^1, ε^2
				350	2.6	5.0 + 6.1	ε^1, binary, 1165 years
				82	2.3	5.2 + 5.5	ε^2, binary, 585 years
ζ	Lyr	18 44.8	+37 36	150	43.7	4.3 + 5.9	ζ^1, ζ^2
β	Lyr	18 50.1	+33 22	149	45.7	3.4 v + 8.6	Sheliak; variable
ο	Dra	18 51.2	+59 23	326	34.2	4.8 + 7.8	
η	Lyr	19 13.8	+39 09	82	28.1	4.4 + 9.1	
2	Vul	19 17.7	+23 02	127	1.8	5.4 + 9.2	ES Vul
α, 8	Vul	19 28.7	+24 40	28	413.7	4.4 + 5.8	
β	Cyg	19 30.9	+27 58	54	34.4	3.1 + 5.1	Albireo
δ	Cyg	19 45.0	+45 08	221	2.5	2.9 + 6.3	Binary, 827.6 years
17	Cyg	19 46.4	+33 44	69	26.0	5.0 + 9.2	
ψ	Cyg	19 55.6	+52 26	178	3.2	4.9 + 7.4	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
—	Steph 1	Lyr	18 53.5	+36 55	3.8	20	15	δ Lyrae Cluster
—	Cr 399	Vul	19 25.4	+20 11	3.6	60	40	Brocchi's Cluster
6811		Cyg	19 38.2	+46 34	6.8	13	70	
6819		Cyg	19 41.3	+40 11	7.3	5		
6823		Vul	19 43.1	+23 18	7.1	12	30	In nebula 6820
6830		Vul	19 51.0	+23 04	7.9	12	20	
6834		Cyg	19 52.2	+29 25	7.8	5	50	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	
6205	M13	Her	16 41.7	+36 28	5.9	16.6	Hercules Cluster
6229		Her	16 47.0	+47 32	9.4	4.5	
6341	M92	Her	17 17.1	+43 08	6.5	11.2	
6779	M56	Lyr	19 16.6	+30 11	8.2	7.1	

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
6210		Her	16 44.5	+23 49	9.3	14	12.9	
—	PK51+9.1	Her	18 49.7	+20 51	12.2	3	13.0	
6720	M57	Lyr	18 53.6	+33 02	9.7	70/150	14.8	Ring Nebula
—	PK64+5.1	Cyg	19 34.8	+30 31	9.6	8	10.0	
6826		Cyg	19 44.8	+50 31	9.8	30/140	10.4	Blinking Planetary
6853	M27	Vul	19 59.6	+22 43	7.6	350/910	13.9	Dumbbell Nebula

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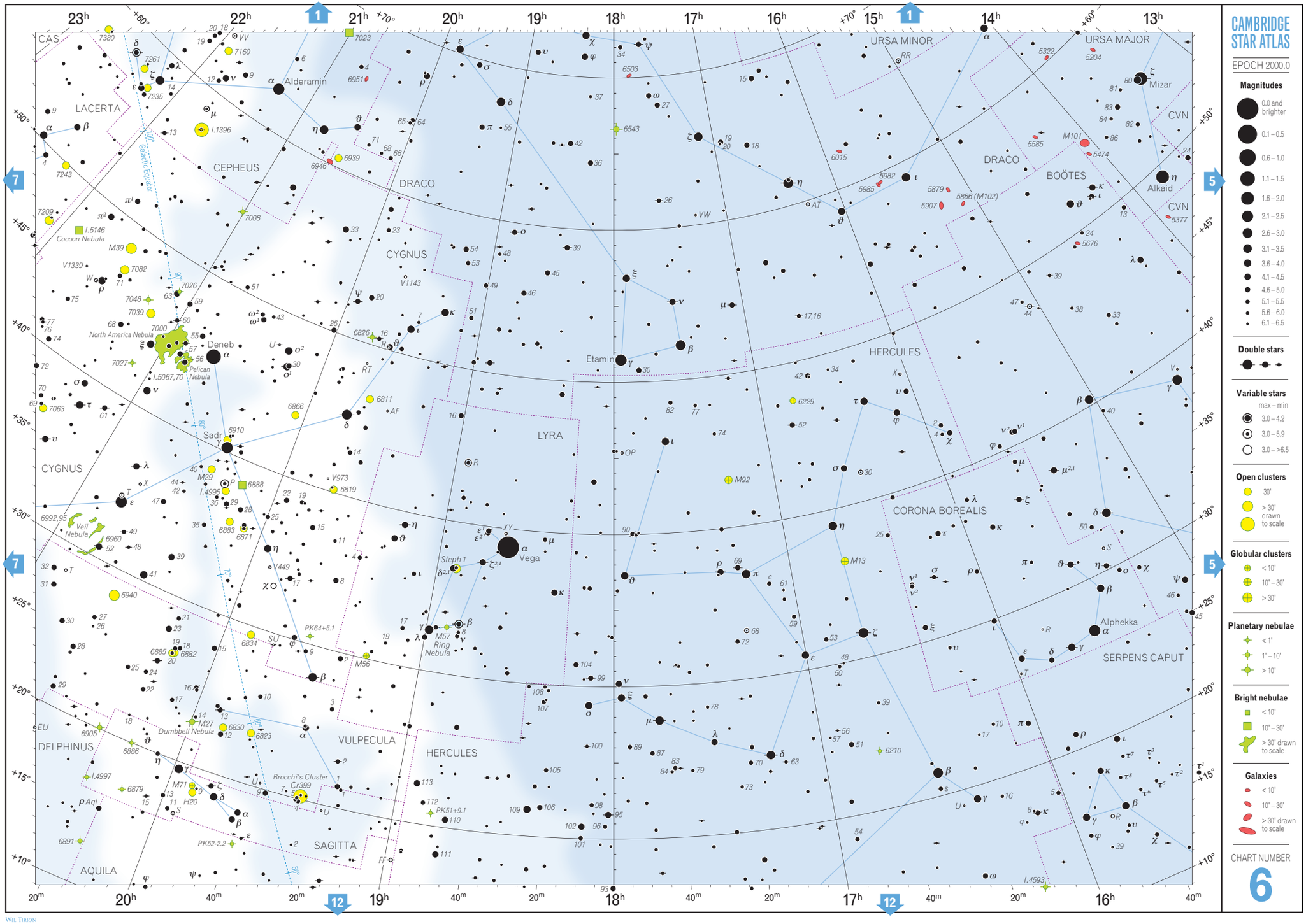

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

6

Wil Tirion

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Chart 7 *RA 20h to 0h, declination +65° to +20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
P	Cyg	20 17.8	+38 02	3.0–6.0	SD	—	B
U	Cyg	20 19.6	+47 54	5.9–12.1	M	462.4	M
X	Cyg	20 43.4	+35 35	5.9–6.7	Cep	16.39	F – G
T	Cyg	20 47.2	+34 22	5.0–5.5	Irr	—	K
T	Vul	20 51.5	+28 15	5.4–6.1	Cep	4.43	F – G
W	Cyg	21 36.0	+45 22	5.0–7.6	SR	126.3	M
V460	Cyg	21 42.0	+35 31	5.6–7.0	Irr	—	M
V1339	Cyg	21 42.1	+45 46	5.9–7.1	SR	35:	M
μ	Cep	21 43.5	+58 47	3.4–5.1	SR	730	M
VV	Cep	21 56.7	+63 38	4.8–5.4	EA	7430	M
AR	Lac	22 08.7	+45 45	6.1–6.8	EA	1.98	G + K
δ	Cep	22 29.2	+58 25	3.9–4.4	Cep	5.37	F – G
V509	Cas	23 00.1	+56 57	4.8–5.5	SR	—	F – K
β	Peg	23 03.8	+28 05	2.3–2.7	Irr	—	M Scheat
Z	And	23 33.7	+48 49	8.0–12.4 p	ZA	—	M
ρ	Cas	23 54.4	+57 30	4.1–6.2	SR	320	F – K
R	Cas	23 58.4	+51 24	4.7–13.5	M	430.5	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
52	Cyg	20 45.7	+30 43	67	6.0	4.2 + 6.4	In Veil Nebula 6920
61	Cyg	21 06.9	+38 45	150	30.3	5.2 + 6.0	Binary, 653.3 years; large p.m.
τ	Cyg	21 14.8	+38 03	306	0.8	3.8 + 6.4	Binary, 49.9 years
υ	Cyg	21 17.9	+34 54	220	15.1	4.4 + 10.0	
μ	Cyg	21 44.1	+28 45	320	1.2	4.8 + 6.1	Binary, 507.5 years
ξ	Cep	22 03.8	+64 38	274	8.2	4.4 + 6.5	Binary, 3800 years
δ	Cep	22 29.2	+58 25	191	41.0	3.9 v + 7.5	Variable
8	Lac	22 35.9	+39 38	186	22.4	5.7 + 6.5	
				169	48.8	10.5	
				144	81.8	9.3	
				239	336.6	7.8	
72	Peg	23 34.0	+31 20	97	0.5	5.7 + 5.8	Binary, 241.2 years
78	Peg	23 44.0	+29 22	235	1.0	5.0 + 8.1	
6	Cas	23 48.8	+62 13	193	1.6	5.5 + 8.0	
σ	Cas	23 59.0	+55 45	326	3.0	5.0 + 7.1	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
6866		Cyg	20 03.7	+44 00	7.6	7	80	
6871		Cyg	20 05.9	+35 47	5.2	20	15	
6883		Cyg	20 11.3	+35 51	8.0	15	30	
6882		Vul	20 11.7	+26 33	8.1	18		Near cluster 6885
6885		Vul	20 12.0	+26 29	5.7	7	30	Contains 20 Vul
I.4996		Cyg	20 16.5	+37 38	7.3	6	15	
6910		Cyg	20 23.1	+40 47	7.4	8	50	
6913	M29	Cyg	20 23.9	+38 32	6.6	7	50	
6939		Cep	20 31.4	+60 38	7.8	8	80	
6940		Vul	20 34.6	+28 18	6.3	31	60	
7039		Cyg	21 11.2	+45 39	7.6	25	50	

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*
7063		Cyg	21 24.4	+36 30	7.0	8	12
7082		Cyg	21 29.4	+47 05	7.2	25	
7092	M39	Cyg	21 32.2	+48 26	4.6	32	30
I.1396		Cep	21 39.1	+57 30	3.5	50	50
7160		Cep	21 53.7	+62 36	6.1	7	12
7209		Lac	22 05.2	+46 30	6.7	25	25
7235		Cep	22 12.6	+57 17	7.7	4	30
7243		Lac	22 15.3	+49 53	6.4	21	40
7261		Cep	22 20.4	+58 05	8.4	6	30
7380		Cep	22 47.0	+58 06	7.2	12	40
7510		Cep	23 11.5	+60 34	7.9	4	60
7654	M52	Cas	23 24.2	+61 35	6.9	13	100
7686		And	23 30.2	+49 08	5.6	15	20
7789		Cas	23 57.0	+56 44	6.7	13	300
7790		Cas	23 58.4	+61 13	8.5	17	40

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
6888		Cyg	20 12.0	+38 21	E	20 × 10	7.4	
6960		Cyg	20 45.7	+30 43	E	70 × 6		Veil Nebula SNR
			20 48.5	+31 09	E	45 × 30		Veil Nebula SNR
I.5067, I.5070		Cyg	20 50.8	+44 21	E	80 × 70		Pelican Nebula
6992		Cyg	20 56.4	+31 43	E	60 × 8		Veil Nebula SNR
6995		Cyg	20 57.1	+31 13	E	12		Veil Nebula SNR
7000		Cyg	20 58.8	+44 20	E	120 × 100	6.0	North America Nebula
I.5146		Cyg	21 53.5	+47 16	E	12 × 12	10.0	Cocoon Nebula
7635		Cas	23 20.7	+61 12	E	15 × 8	6.9	Bubble Nebula

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
6905		Del	20 22.4	+20 07	11.9	46/100	13.5
7008		Cyg	21 00.6	+54 33	13.3	83	13.2
7026		Cyg	21 06.3	+47 51	12.7	21	14.5
7027		Cyg	21 07.1	+42 14	10.4	15	11.3
7048		Cyg	21 14.2	+46 16	11.3	61	18.3
7662		And	23 25.9	+42 33	9.2	20/130	13.2

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
6946		Cep	20 34.8	+60 09	8.9	11.0 × 9.8	Sc
7217		Peg	22 07.9	+31 22	10.2	3.7 × 3.2	Sb
7331		Peg	22 37.1	+34 25	9.5	10.7 × 4.0	Sb
7332		Peg	22 37.4	+23 48	11.0	4.2 × 1.3	E7
7457		Peg	23 01.0	+30 09	10.8	4.4 × 2.5	E
7640		And	23 22.1	+40 51	10.9	10.7 × 2.5	SBb
7741		Peg	23 43.9	+26 05	11.4	4.0 × 2.8	SBc

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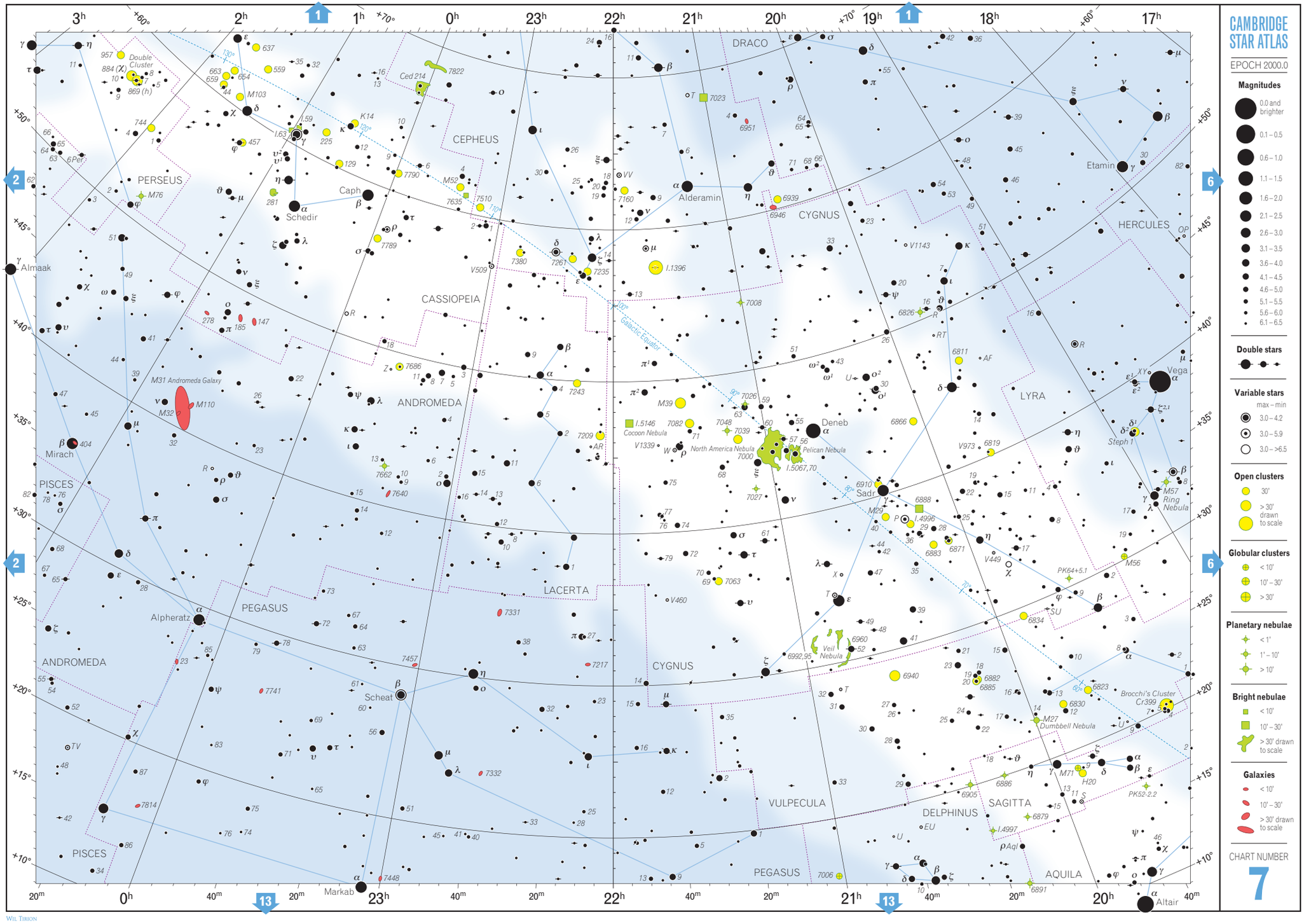

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

7

Wil Tirion

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Chart 8 *RA 0h to 4h, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum	
TV	Psc	00 28.0	+17 54	4.7–5.4	SR	70	M	
o	Cet	02 19.3	–02 59	2.0–10.1	M	332.0	M	Mira
U	Cet	02 33.7	–13 09	6.8–13.4	M	234.8	M	
Z	Eri	02 47.9	–12 28	5.6–7.2	SR	80	M	
RR	Eri	02 52.2	–08 16	6.3–8.1	SR	97	M	

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
51	Psc	00 32.4	+06 57	83	27.5	5.7 + 9.5	
26	Cet	01 03.8	+01 22	253	16.0	6.2 + 8.6	
ζ	Psc	01 13.7	+07 35	63	23.0	5.6 + 6.5	
37	Cet	01 14.4	–07 55	331	49.7	5.2 + 8.7	
χ	Cet	01 49.6	–10 41	250	183.8	4.9 + 6.9	
γ	Ari	01 53.5	+19 18	0	7.8	4.8 + 4.8	Mesartim
α	Psc	02 02.0	+02 46	272	1.8	4.2 + 5.1	Binary, 933.1 years
66	Cet	02 12.8	–02 24	234	16.5	5.7 + 7.5	
84	Cet	02 41.2	–02 42	310	4.0	5.8 + 9.0	
γ	Cet	02 43.3	+03 14	294	2.8	3.5 + 7.3	
π	Ari	02 49.3	+17 28	120	3.2	5.2 + 8.7	
ρ^2	Eri	03 02.7	–07 41	75	1.8	5.3 + 9.5	
95	Cet	03 18.4	–00 56	250	1.1	5.6 + 7.5	Binary, 217.2 years

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
246		Cet	00 47.0	–11 53	8.0	225	11.9

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
7814		Peg	00 03.3	+16 09	10.5	6.3 × 2.6	Sb
128		Psc	00 29.3	+02 52	11.6	3.4 × 1.0	S0
157		Cet	00 34.8	–08 24	10.4	4.3 × 2.9	Sc
210		Cet	00 40.6	–13 52	10.9	5.4 × 3.7	Sb
255		Cet	00 47.8	–11 28	11.8	3.1 × 2.8	Sb
309		Cet	00 56.7	–09 55	11.8	3.1 × 2.7	Sc
337		Cet	00 59.8	–07 35	11.6	2.8 × 2.0	Sc
I.1613		Cet	01 04.8	+02 07	9.3	12.0 × 11.2	Irr
428		Cet	01 12.9	+00 59	11.4	4.1 × 3.2	Sc
474		Psc	01 20.1	+03 25	11.1	7.9 × 7.2	S0
488		Psc	01 21.8	+05 15	10.3	5.2 × 4.1	Sb
524		Psc	01 24.8	+09 32	10.6	3.2 × 3.2	E1
584		Cet	01 31.1	–06 52	10.4	3.8 × 2.4	E4
628	M74	Psc	01 36.7	+15 47	9.2	10.2 × 9.5	Sc
676		Psc	01 49.0	+05 54	11.0	4.3 × 1.5	Sa
720		Cet	01 53.0	–13 44	10.2	4.4 × 2.8	E3
772		Ari	01 59.3	+19 01	10.3	7.1 × 4.5	Sb
779		Cet	01 57.7	–05 58	11.1	4.1 × 4.5	Sb
864		Cet	02 15.5	+06 00	11.0	4.6 × 3.5	Sc
895		Cet	02 21.6	–05 31	11.8	3.6 × 2.8	Sb
936		Cet	02 27.6	–01 09	10.1	5.2 × 4.4	SBa
988		Cet	02 35.4	–09 21	11:	4.7 × 2.7	SBc
1042		Cet	02 40.4	–08 26	10.9	4.7 × 3.9	Sc
1052		Cet	02 41.1	–08 15	10.6	2.9 × 2.0	E2
1055		Cet	02 41.8	+00 26	10.6	7.6 × 3.0	Sb
1068	M77	Cet	02 42.7	–00 01	8.8	6.9 × 5.9	Sb
1073		Cet	02 43.7	+01 23	11.0	4.9 × 4.6	SBc
1084		Eri	02 46.0	–07 35	10.6	2.9 × 1.5	Sc
1087		Cet	03 46.4	–00 30	11.1	3.5 × 2.3	Sc
1179		Eri	03 02.6	–18 54	11.8	4.6 × 3.9	S
1300		Eri	03 19.7	–19 25	10.4	6.5 × 4.3	SBb
1337		Eri	03 28.1	–08 23	11.7	6.8 × 2.0	S
1407		Eri	03 40.2	–18 35	9.8	2.5 × 2.5	E0

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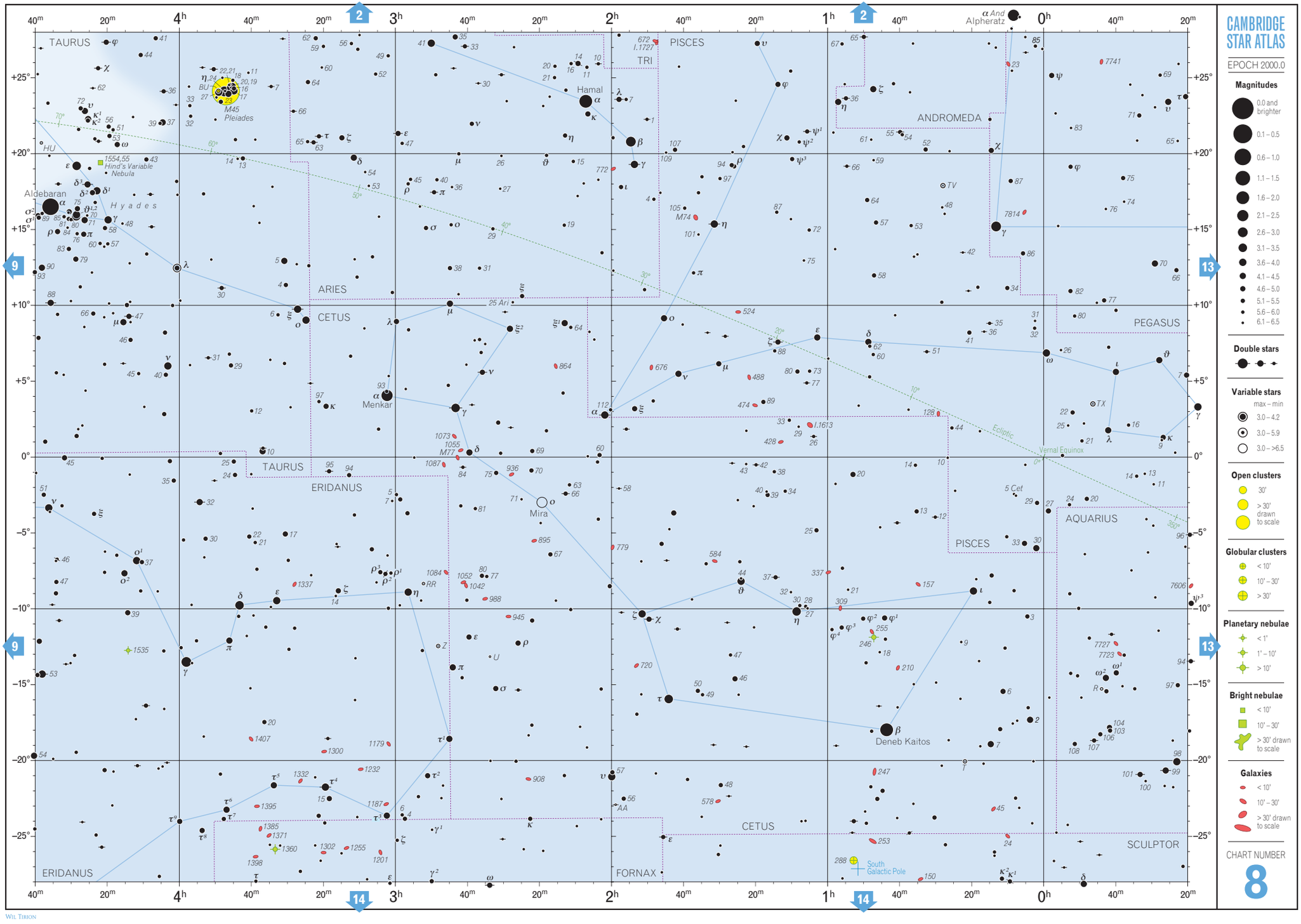

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

0.0 and brighter
0.1 – 0.5
0.6 – 1.0
1.1 – 1.5
1.6 – 2.0
2.1 – 2.5
2.6 – 3.0
3.1 – 3.5
3.6 – 4.0
4.1 – 4.5
4.6 – 5.0
5.1 – 5.5
5.6 – 6.0
6.1 – 6.5

Double stars

Variable stars

max – min
3.0 – 4.2
3.0 – 5.9
3.0 – >6.5

Open clusters

30'
> 30' drawn to scale

Globular clusters

< 10'
10' – 30'
> 30'

Planetary nebulae

< 1'
1' – 10'
> 10'

Bright nebulae

< 10'
10' – 30'
> 30' drawn to scale

Galaxies

< 10'
10' – 30'
> 30' drawn to scale

CHART NUMBER

8

Wil Tirion

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Chart 9 *RA 4ʰ to 8ʰ, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum	
λ	Tau	04 00.7	+12 29	3.3–3.8	EA	3.95	B + A	
R	Lep	04 59.6	–14 18	5.5–11.7	M	432.1	M	
W	Ori	05 05.4	+01 11	5.9–7.7	SR	212	B	
RX	Lep	05 11.4	–11 51	5.0–7.0	Irr	—	B	
CK	Ori	05 30.3	+04 12	5.9–7.1	SR	120:	M	
α	Ori	05 55.2	+07 24	0.4–1.3	SR	2110	M	Betelgeuse
V	Mon	06 22.7	–02 12	6.0–13.7	M	333.8	M	
T	Mon	06 25.2	+07 05	5.6–6.6	Cep	27.02	F – K	
BL	Ori	06 25.5	+14 43	6.3–6.90	Irr	—	M	
R	CMa	07 19.5	–16 24	5.7–6.3	EA	1.14	F	
U	Mon	07 30.8	–09 47	5.9–7.8	RV	92.26	F – K	
BN	Gem	07 37.1	+16 54	6.0–6.6 p	Irr	—	O	

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
47	Tau	04 13.9	+09 16	351	1.1	4.9 + 7.4	
ϑ^1, ϑ^2	Tau	04 28.7	+15 52	346	337.4	3.4 + 3.8	
σ^1, σ^2	Tau	04 39.3	+15 55	193	431.2	4.7 + 5.1	
55	Eri	04 43.6	–08 48	317	9.2	6.7 + 6.8	
14	Ori	05 07.9	+08 30	322	0.8	5.8 + 6.5	Binary, 198.9 years
ρ	Ori	05 13.3	+02 52	64	7.0	4.5 + 8.3	
κ	Lep	05 13.2	–12 56	358	2.6	4.5 + 7.4	
β	Ori	05 14.5	–08 12	202	9.5	0.2 + 6.8	Rigel
η	Ori	05 24.5	–02 24	80	1.5	3.8 + 4.5	
θ^1	Ori	05 35.3	–05 23	31	8.8	6.7 + 7.9	Trapezium; in Orion Nebula
				132	12.8	5.1	
				96	21.5	6.7	
θ^2	Ori	05 35.4	–05 25	92	52.5	5.2 + 6.5	In Orion Nebula
ι	Ori	05 35.4	–05 55	141	11.3	2.8 + 6.9	
ζ	Ori	05 40.8	–01 57	165	2.3	1.9 + 4.0	Alnitak; binary, 1509 years
75	Ori	06 17.1	+09 57	258	62.7	5.4 + 9.5	
				159	117.3	8.5	
8	Mon	06 23.8	+04 36	27	13.4	4.5 + 6.5	= ε Mon
β	Mon	06 28.8	–07 02	132	7.3	4.7 + 5.2	
				124	10.0	6.1	
ν^1	CMa	06 36.4	–18 40	262	17.5	5.8 + 8.5	
15	Mon	06 41.0	+09 54	213	2.8	4.7 + 7.5	S Mon
				13	16.6	9.8	
				308	41.3	9.6	In cluster 2264
				139	73.9	9.9	
				222	156.0	7.7	
α	CMa	06 45.2	–16 43	150	4.6	–1.4 + 8.5	Sirius; binary 50.1 years
38	Gem	06 54.6	+13 11	145	7.1	4.7 + 7.7	Binary, 3,190 years
μ	CMa	06 56.1	–14 03	340	3.0	5.3 + 8.6	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*
1647		Tau	04 46.0	+19 04	6.4	45	200
1662		Ori	04 48.5	+10 56	6.4	20	35
1807		Tau	05 10.7	+16 32	7.0	17	20
1817		Tau	05 12.1	+16 42	7.7	16	60
1981		Ori	05 35.2	–04 26	4.6	25	20
2169		Ori	06 08.4	+13 57	5.9	7	30

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
2194		Ori	06 13.8	+12 48	8.5	10	80	
2204		CMa	06 15.7	–18 39	8.6	13	80	
2215		Mon	06 21.0	–07 17	8.4	11	40	
2232		Mon	06 26.6	–04 45	3.9	30	20	Contains 10 Mon
2244		Mon	06 32.4	+04 52	4.8	24	100	In Rosette Nebula
2252		Mon	06 35.0	+05 23	7.7	20	30	
2286		Mon	06 47.6	–03 10	7.5	15	50	Asterism?
2301		Mon	06 51.8	+00 28	6.0	12	80	
2323	M50	Mon	07 03.2	–08 20	5.9	16	80	
2335		Mon	07 06.6	–10 05	7.2	12	35	
2343		Mon	07 08.3	–10 39	6.7	7	20	
2345		CMa	07 08.3	–13 10	7.7	12	70	
2353		Mon	07 14.6	–10 18	7.1	20	30	
2360		CMa	07 17.8	–15 37	7.2	13	80	
2374		CMa	07 24.0	–13 16	8.0	19	25	
2395		Gem	07 27.1	+13 35	8.0	12	30	
2414		Pup	07 33.3	–15 27	7.9	4	35	
2422	M47	Pup	07 36.6	–14 30	4.4	30	30	
2423		Pup	07 37.1	–13 52	6.7	19	40	
—	Mel71	Cep	07 37.5	–12 04	7.1	9	80	
2437	M46	Pup	07 41.8	–14 49	6.1	27	100	Contains pl. neb. 2438

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
1554, 1555		Tau	04 21.8	+19 32	R	Var	9.4	Hind's Variable Nebula
1973		Ori	05 35.1	–04 44	E + R	5 × 5	7.4	
1975		Ori	05 35.4	–04 41	E + R	10 × 5	10.9	
1976	M42	Ori	05 35.4	–05 27	E + R	66 × 60	2.9	Great Orion Nebula
1977		Ori	05 35.5	–04 52	E + R	20 × 10	4.6	
1982	M43	Ori	05 35.6	–05 16	E + R	20 × 15	6.9	Extension of M42
I.434		Ori	05 41.0	–02 24	E	60 × 10	2.1	Contains Horse Head Nebula (B33)
2024		Ori	05 40.7	–02 27	E	30 × 30	2.1	ζ Ori
2068	M78	Ori	05 46.7	+00 03	R	8 × 6	10.5	
2237-2239		Mon	06 32.3	+05 03	E	80 × 60		Rosetta Nebula
2261	R Mon	Mon	06 39.2	+08 44	E + R	2 × 1	10.0	Hubble's Variable Nebula
2264	S Mon	Cep	06 40.9	+09 54	E	60 × 30	4.5	Includes Cone Nebula
I.2177		Mon	07 05.1	–10 42	E	120 × 40	6.2	

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
1535		Eri	04 14.2	–12 44	9.6	18/44	12.2	
I.418		Lep	05 27.5	–12 42	10.7	12	10.6	
2438		Pup	07 41.8	–14 44	10.1	66	17.7	In open cluster 2437
2440		Pup	07 41.9	–18 13	10.8	14/32	14.3	

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
1637		Eri	04 41.5	–02 51	10.9	3.3 × 2.9	Sc
1723		Eri	04 59.4	–10 59	12:	3.7 × 2.3	SB

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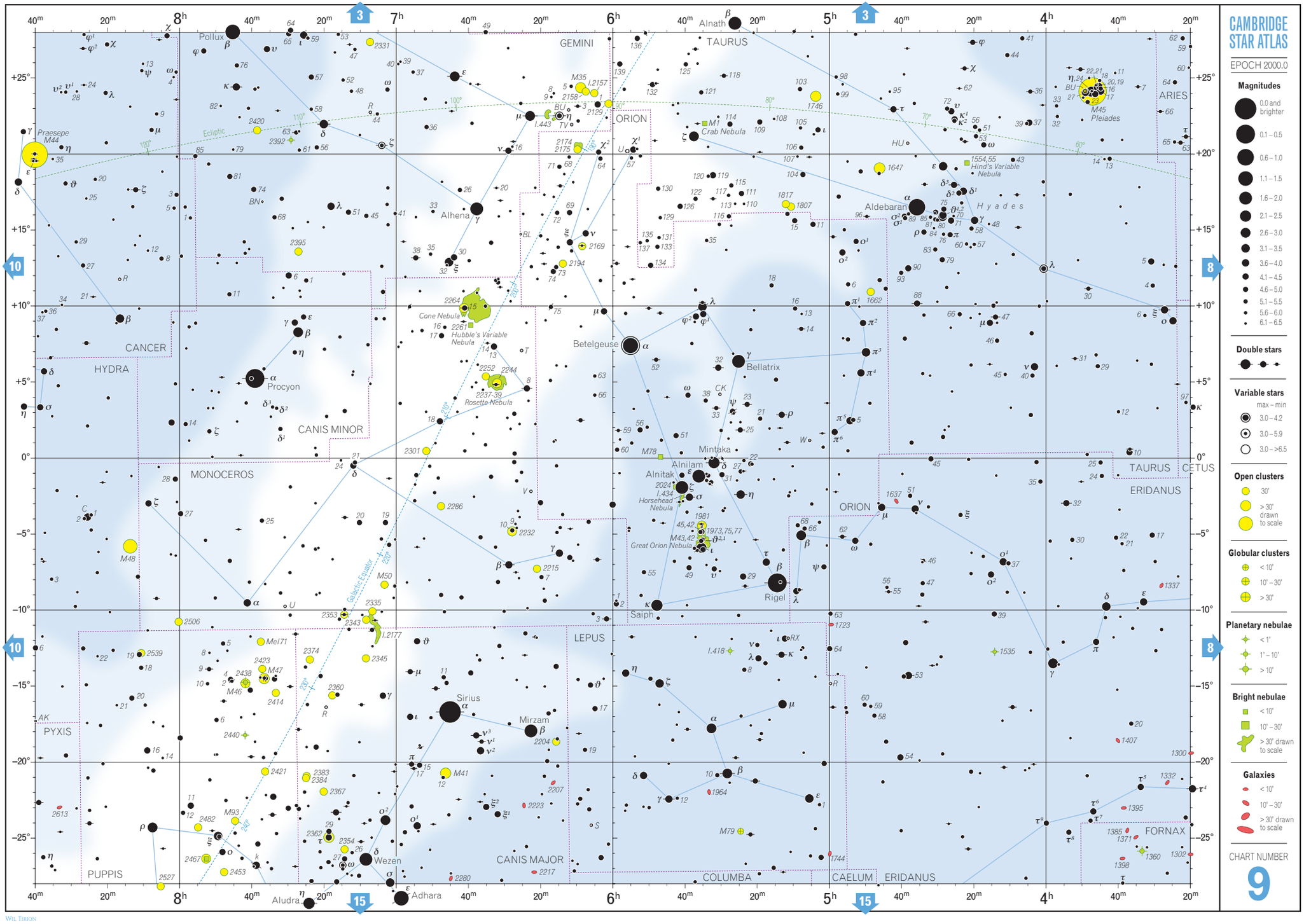

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

0.0 and brighter
0.1 – 0.5
0.6 – 1.0
1.1 – 1.5
1.6 – 2.0
2.1 – 2.5
2.6 – 3.0
3.1 – 3.5
3.6 – 4.0
4.1 – 4.5
4.6 – 5.0
5.1 – 5.5
5.6 – 6.0
6.1 – 6.5

Double stars

Variable stars

max – min
3.0 – 4.2
3.0 – 5.9
3.0 – >6.5

Open clusters

30'
> 30' drawn to scale

Globular clusters

< 10'
10' – 30'
> 30'

Planetary nebulae

< 1'
1' – 10'
> 10'

Bright nebulae

< 10'
10' – 30'
> 30' drawn to scale

Galaxies

< 10'
10' – 30'
> 30' drawn to scale

CHART NUMBER

9

Wil Tirion

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Chart 10 *RA 8h to 12h, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
R	Cnc	08 16.6	+11 44	6.1–11.8	M	361.6	M
AK	Hya	08 39.9	–17 18	6.3–6.9	SR	112:	M
X	Cnc	08 55.4	+17 14	5.6–7.5	SR	195:	K
R	Leo	09 47.6	+11 26	4.4–11.3	M	312.4	M
U	Hya	10 37.6	–13 23	4.3–6.5	SR	450:	B

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
ζ	Cnc	08 12.2	+17 39	72	6.0	5.6 + 6.2	Binary, 1150 years
				86	0.8	6.0	Binary, 59.7 years
ε	Hya	08 46.8	+06 25	302	2.7	3.8 + 4.7	Binary, 890 years
27	Hya	09 20.5	–09 33	211	229.4	5.0 + 6.9	
ω	Leo	09 28.5	+09 03	84	0.6	5.9 + 6.5	Binary, 118.2 years
6	Leo	09 32.0	+09 43	75	37.4	5.2 + 8.2	
γ	Sex	09 52.5	–08 06	56	0.6	5.6 + 6.1	Binary, 75.6 years
α	Leo	10 08.4	+11 58	307	176.9	1.4 + 7.7	Regulus
γ	Leo	10 20.0	+19 51	125	4.4	2.2 + 3.5	Algieba; binary, 618.6 years
				291	259.9	9.2	
				302	333.0	9.6	
49	Leo	10 35.0	+08 39	157	2.4	5.8 + 8.5	TX Leo
ι	Leo	11 23.9	+10 32	117	1.7	4.0 + 6.7	Binary, 192 years
γ	Crt	11 24.9	–17 41	96	5.2	4.1 + 9.6	
90	Leo	11 34.7	+16 48	209	3.3	6.0 + 7.3	
				234	63.1	8.7	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
2506		Mon	08 00.2	–10 47	7.6	7	150	
2539		Pup	08 10.7	–12 50	6.5	22	50	
2548	M48	Hya	08 13.8	–05 48	5.8	54	80	
2632	M44	Cnc	08 40.1	+19 59	3.1	95	50	Praesepe; Beehive
2682	M67	Cnc	08 50.4	+11 49	6.9	30	200	

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
3242		Hya	10 24.8	–18 38	8.6	26/40	12.0	Ghost of Jupiter

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
2775		Cnc	09 10.3	+07 02	10.3	4.5 × 3.5	Sa	
2967		Sex	09 42.1	+00 20	11.6	3.0 × 2.9	Sc	
2974		Sex	09 42.6	–03 42	10.8	3.4 × 2.1	Sa	
—	U5373	Sex	10 00.0	+05 20	11.4	4.6 × 3.3	Irr	
3115		Sex	10 05.2	–07 43	9.2	8.3 × 3.2	E6	
—	U5470	Leo	10 08.4	+12 18	9.8	10.7 × 8.3	dE3	Leo I
3166		Sex	10 13.8	+03 26	10.6	5.2 × 2.7	SBa	
3169		Sex	10 14.2	+03 28	10.5	4.8 × 3.2	Sb	
3351	M95	Leo	10 44.0	+11 42	9.7	7.4 × 5.1	SBb	
3367		Leo	10 46.6	+13 45	11.5	2.3 × 2.1	Sc	
3368	M96	Leo	10 46.8	+11 49	9.2	7.1 × 5.1	Sb	
3377		Leo	10 47.7	+13 59	10.2	4.4 × 2.7	E5	
3379	M105	Leo	10 47.8	+12 35	9.3	4.5 × 4.0	E1	
3384		Leo	10 48.3	+12 38	10.0	5.9 × 2.6	E7	
3412		Leo	10 50.9	+13 25	10.6	3.6 × 2.0	E5	
3489		Leo	11 00.3	+13 54	10.3	3.7 × 2.1	E6	
3507		Leo	11 03.5	+18 08	11.4	3.5 × 3.0	SBb	
3521		Leo	11 05.8	–00 02	8.9	9.5 × 5.0	Sb	
3593		Leo	11 14.6	+12 49	11.0	5.8 × 2.5	Sb	
3596		Leo	11 15.1	+14 47	11.6	4.2 × 4.1	Sc	
3607		Leo	11 16.9	+18 03	10.0	3.7 × 3.2	E1	
3623	M65	Leo	11 18.9	+13 05	9.3	10.0 × 3.3	Sb	
3626		Leo	11 20.1	+18 21	10.9	3.1 × 2.2	Sb	
3627	M66	Leo	11 20.2	+12 59	9.0	8.7 × 4.4	Sb	
3628		Leo	11 20.3	+13 36	9.5	14.8 × 3.6	Sb	
3640		Leo	11 21.1	+03 14	10.3	4.1 × 3.4	E1	
3655		Leo	11 22.9	+16 35	11.6	1.6 × 1.1	S:	
3672		Crt	11 25.0	–09 48	11.5	4.1 × 2.1	Sb	
3686		Leo	11 27.7	+17 13	11.4	3.3 × 2.6	Sc	
3810		Leo	11 41.0	+11 28	10.8	4.3 × 3.1	Sc	
3818		Vir	11 42.0	–06 09	11.8	2.1 × 1.4	E2	
3887		Crt	11 47.1	–16 51	11.0	3.3 × 2.7	Sc	
3962		Crt	11 54.7	–13 58	10.6	2.9 × 2.6	E2	
4027		Crv	11 59.5	–19 16	11.1	3.0 × 2.3	Sc	

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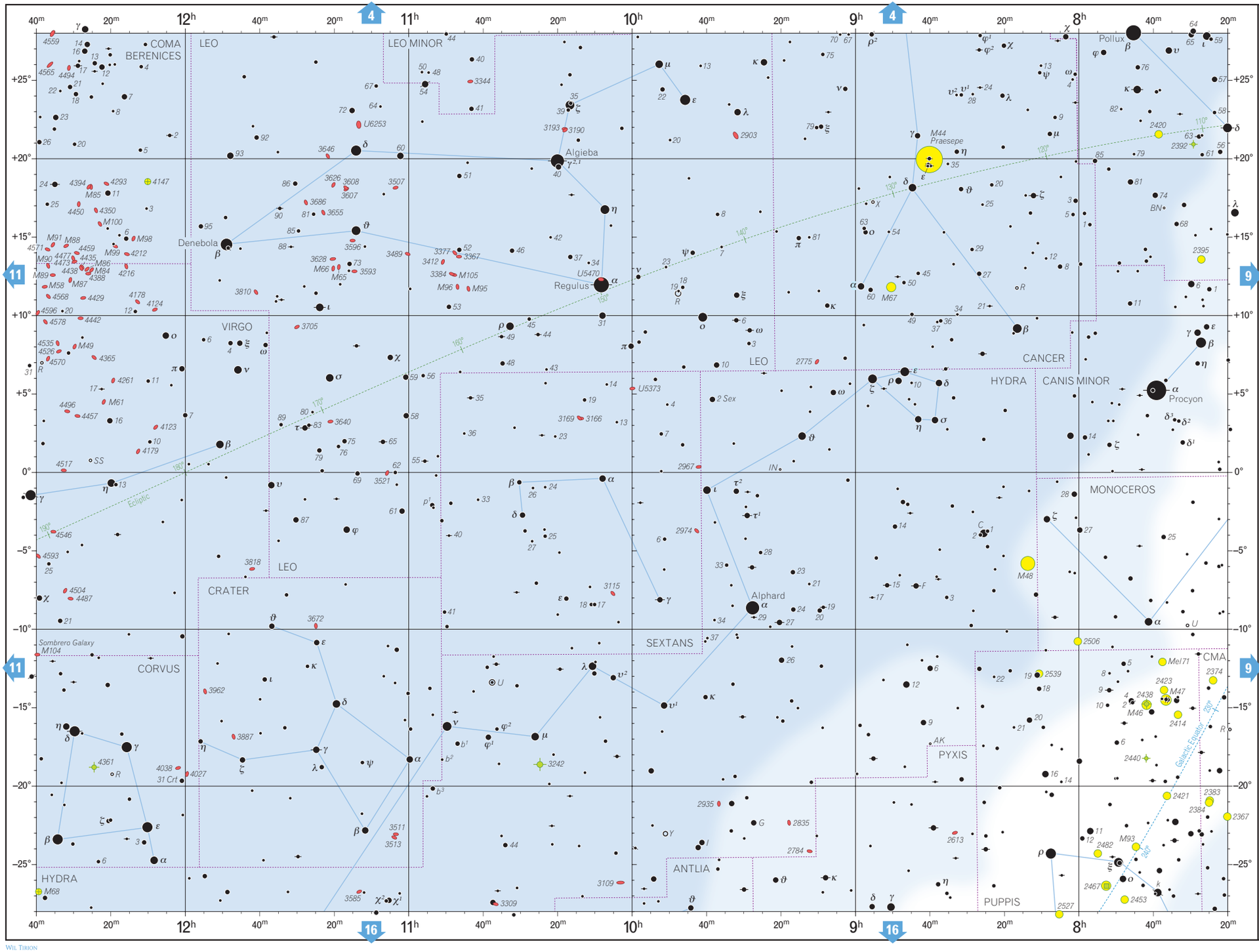

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes
- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars (max – min)
- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters
- 30'
- > 30' drawn to scale

Globular clusters
- < 10'
- 10' – 30'
- > 30'

Planetary nebulae
- < 1'
- 1' – 10'
- > 10'

Bright nebulae
- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies
- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER **10**

Wil Tirion

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Chart 11 *RA 12ʰ to 16ʰ, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
R	Crv	12 19.6	–19 15	6.7–14.4	M	317.0	M
SS	Vir	12 25.3	+00 48	6.0–9.6	M	354.7	K
R	Vir	12 38.50	+06 59	6.0–12.1	M	145.6	M
S	Vir	13 33.0	–07 12	6.3–13.2	M	377.4	M
δ	Lib	15 01.0	–08 31	4.9–5.9	EA	2.33	B
R	Ser	15 50.7	+15 08	5.2–14.4	M	356.4	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
17	Vir	12 22.5	+05 18	337	20.0	6.6 + 9.4	
δ	Crv	12 29.9	–16 31	214	24.2	3.0 + 9.2	Algorab
24	Com	12 35.1	+18 23	271	20.3	5.2 + 6.7	
γ	Vir	12 41.7	–01 27	267	1.8	3.5 + 3.5	Porrima; binary, 171.4 years
θ	Vir	13 09.9	–05 32	343	7.1	4.4 + 9.4	
84	Vir	13 43.1	+03 32	229	2.9	5.5 + 7.9	
π	Boo	14 40.7	+16 25	108	5.6	4.9 + 5.8	
ζ	Boo	14 41.1	+13 44	300	0.8	4.5 + 4.6	Binary, 123.4 years
μ	Lib	14 49.3	–14 09	355	1.8	5.8 + 6.7	
α^2, α^1	Lib	14 50.9	–16 02	314	231.0	2.8 + 5.2	Zubenalgenubi
ι	Lib	15 12.2	–19 47	111	57.8	5.1 + 9.4	Binary, 22.4 years
δ	Ser	15 34.8	+10 32	176	4.4	4.2 + 5.2	Binary, 3,168 years
47	Lib	15 55.0	–19 23	129	0.5	6.1 + 8.1	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
4147		Com	12 10.1	+18 33	10.3	4.0
5024	M53	Com	13 12.9	+18 10	7.7	12.6
5053		Com	13 16.4	+17 42	9.8	10.5
5634		Vir	14 29.6	–05 59	9.6	4.9
5904	M5	Ser	15 18.6	+02 05	5.8	17.4

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
4361		Crv	12 24.5	–18 48	10.3	45/110	13.2

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
4038		Crv	12 01.9	–18 52	10.7	2.6 × 1.8	Sc
4123		Vir	12 08.2	+02 53	11.2	4.50 × 3.5	SBb
4178		Vir	12 12.8	+10 52	11.4	5.0 × 2.0	SBc
4179		Vir	12 12.9	+01 18	10.9	4.2 × 1.2	S0
4192	M98	Com	12 13.8	+14 54	10.1	9.5 × 3.2	Sb
4212		Com	12 15.7	+13 54	11.2	3.0 × 2.1	Sb
4216		Vir	12 15.9	+13 09	10.0	8.3 × 2.2	Sb
4254	M99	Com	12 18.8	+14 25	9.8	5.4 × 4.8	Sc
4261		Vir	12 19.4	+05 49	10.3	3.9 × 3.2	E2
4293		Com	12 21.2	+18 23	11.2	6.0 × 3.0	Sa
4303	M61	Vir	12 21.9	+04 28	9.7	6.0 × 5.5	Sc
4321	M100	Com	12 22.9	+15 49	9.4	6.9 × 6.2	Sc
4350		Vir	12 24.0	+16 42	11.1	3.2 × 1.1	E7
4365		Vir	12 24.5	+07 19	10.5	6.2 × 4.6	E2
4374	M84	Vir	12 25.1	+12 53	9.3	5.0 × 4.4	E1
4382	M85	Com	12 25.4	+18 11	9.2	7.1 × 5.2	E
4388		Vir	12 25.8	+12 40	11.1	5.1 × 1.4	Sb
4394		Com	12 25.9	+18 13	10.9	3.9 × 3.5	SBb
4406	M86	Vir	12 26.2	+12 57	9.2	7.4 × 5.5	E3
4429		Vir	12 27.4	+11 07	10.2	5.5 × 2.6	S0
4435		Vir	12 27.7	+13 05	10.9	3.0 × 1.0	E4
4438		Vir	12 27.8	+13 01	10.1	9.3 × 3.9	Sa
4442		Vir	12 28.1	+09 48	10.5	4.6 × 1.9	E5
4450		Com	12 28.5	+17 05	10.1	4.8 × 3.5	Sb

Galaxies *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
4457		Vir	12 29.0	+03 33	10.8	3.0 × 2.5	SBa	
4459		Com	12 29.0	+13 59	10.4	3.8 × 2.8	E2	
4472	M49	Vir	12 29.8	+80 00	8.4	8.9 × 7.4	E4	
4473		Vir	12 29.8	+13 26	10.2	4.5 × 2.6	E4	
4477		Com	12 30.0	+13 38	10.4	4.0 × 3.5	SBa	
4486	M87	Vir	12 30.8	+12 24	8.6	7.2 × 6.8	E1	Virgo A; 3C274
4487		Vir	12 31.1	–08 03	11.5	4.1 × 3.0	Sc	
4496		Vir	12 31.7	+03 56	11.7	3.9 × 3.1	SBc	
4501	M88	Com	12 32.0	+14 25	9.5	6.9 × 3.9	Sb	
4504		Vir	12 32.3	–07 34	11.7	4.0 × 2.0	Sc	
4517		Vir	12 32.8	+00 07	10.5	10.2 × 1.9	Sc	
4526		Vir	12 34.0	+07 42	9.6	7.2 × 2.3	E7	
4535		Vir	12 34.3	+08 12	9.8	6.8 × 5.0	SBc	
4548	M91	Com	12 35.4	+14 30	10.2	5.4 × 4.4	SBb	
4546		Vir	12 35.5	–03 48	10.3	3.5 × 1.7	E6	
4552	M89	Vir	12 35.7	+12 33	9.8	4.2 × 4.2	E0	
4568		Vir	12 36.6	+11 14	10.8	4.6 × 2.1	Sc	
4569	M90	Vir	12 36.8	+13 10	9.5	9.5 × 4.7	Sb	
4570		Vir	12 36.9	+07 15	10.9	4.1 × 1.3	S0	
4571		Vir	12 36.9	+14 13	11.3	3.8 × 3.4	Sc	
4578		Vir	12 37.5	+09 33	11.4	3.6 × 2.8	Sa	
4579	M58	Vir	12 37.7	+11 49	9.8	5.4 × 4.4	Sb	
4596		Vir	12 39.9	+10 11	10.5	3.9 × 2.8	SBa	
4594	M104	Vir	12 40.0	–11 37	8.3	8.9 × 4.1	Sb	Sombrero Galaxy
4621	M59	Vir	12 42.0	+11 39	9.8	5.1 × 3.4	E3	
4636		Vir	12 42.8	+02 41	9.6	6.2 × 5.0	E1	
4643		Vir	12 43.3	+01 59	10.6	3.4 × 2.7	SBa	
4649	M60	Vir	12 43.7	+11 33	8.8	7.2 × 6.2	E1	
4651		Com	12 43.7	+16 24	10.7	3.8 × 2.7	Sc	
4654		Vir	12 44.0	+13 08	10.5	4.7 × 3.0	Sc	
4665		Vir	12 45.1	+03 03	11.6	4.2 × 3.5	SBa	
4666		Vir	12 45.1	–00 28	10.8	4.5 × 1.5	Sc	
4689		Com	12 47.8	+13 46	10.9	4.0 × 3.5	Sb	
4691		Vir	12 48.2	–03 20	11.2	3.2 × 2.7	SBb	
4697		Vir	12 48.6	–05 48	9.3	6.0 × 3.8	E4	
4698		Vir	12 48.4	+08 29	10.7	4.3 × 2.5	Sb	
4699		Vir	12 49.0	–08 40	9.6	3.5 × 2.7	Sa	
4710		Vir	12 49.6	+15 10	11.0	5.1 × 1.4	S0	
4731		Vir	12 51.0	–06 24	11.3	6.5 × 3.4	SBc	
4754		Vir	12 52.3	+11 19	10.6	4.7 × 2.6	SB0	
4753		Vir	12 52.4	–01 12	9.9	5.4 × 2.9	Pec	
4762		Vir	12 52.9	+11 14	10.2	8.7 × 1.6	SB0	
4781		Vir	12 54.4	–10 32	11.8	3.5 × 1.8	Sc	
4818		Vir	12 56.8	–08 31	11.7	4.5 × 1.7	SB	
4856		Vir	12 59.3	–15 02	10.4	4.6 × 1.6	SBa	
4866		Vir	12 59.5	+14 10	11.0	6.5 × 1.5	Sb	
4900		Vir	13 00.6	+02 30	11.5	2.3 × 2.2	Sc	
4902		Vir	13 01.0	–14 31	11.2	3.0 × 2.8	Sb	
4939		Vir	13 04.2	–10 20	11.4	5.8 × 3.2	Sb	
4941		Vir	13 04.2	–05 33	11.1	3.7 × 2.1	Sb	
4958		Vir	13 05.8	–08 01	10.5	4.1 × 1.4	E6	
4984		Vir	13 09.0	–15 31	11.8	2.8 × 2.2	Sc	
4995		Vir	13 09.7	–07 50	11.0	2.5 × 1.7	Sb	
5018		Vir	13 13.0	–19 31	10.8	2.6 × 2.1	Sa	
5044		Vir	13 15.4	–16 23	11.0	2.6 × 2.6	E0	
5054		Vir	13 17.0	–16 38	11.3	5.0 × 3.1	Sb	
5170		Vir	13 29.8	–17 58	11.8	8.1 × 1.3	Sb	
5247		Vir	13 38.1	–17 53	10.5	5.4 × 4.7	Sb	
5248		Boo	13 37.5	+08 53	10.2	6.5 × 4.9	Sc	
5363		Vir	13 56.1	+05 15	10.2	4.2 × 2.7	E	
5364		Vir	13 56.2	+05 01	10.4	7.1 × 5.0	Sb	
5427		Vir	14 03.4	–06 02	11.4	2.5 × 2.3	Sc	
5566		Vir	14 20.3	+03 56	10.5	6.5 × 2.4	Sb	
5576		Vir	14 21.1	+03 16	10.9	3.2 × 2.2	E2	
5668		Vir	14 33.4	+04 27	11.5	3.3 × 3.1	Sc	
5701		Vir	14 39.2	+05 22	11.8	4.7 × 4.5	SB	
5713		Vir	14 40.2	–00 17	11.4	2.8 × 2.5	Sc	
5746		Vir	14 44.9	+01 57	10.6	7.9 × 1.7	Sb	
5813		Vir	15 01.2	+01 42	10.7	3.6 × 2.8	E1	
5838		Vir	15 05.4	+02 06	10.8	4.2 × 1.6	Sa	
5846		Vir	15 06.8	+01 36	10.2	3.4 × 3.2	E0	
5885		Vir	15 15.1	–10 05	11.7	3.5 × 3.2	Sc	

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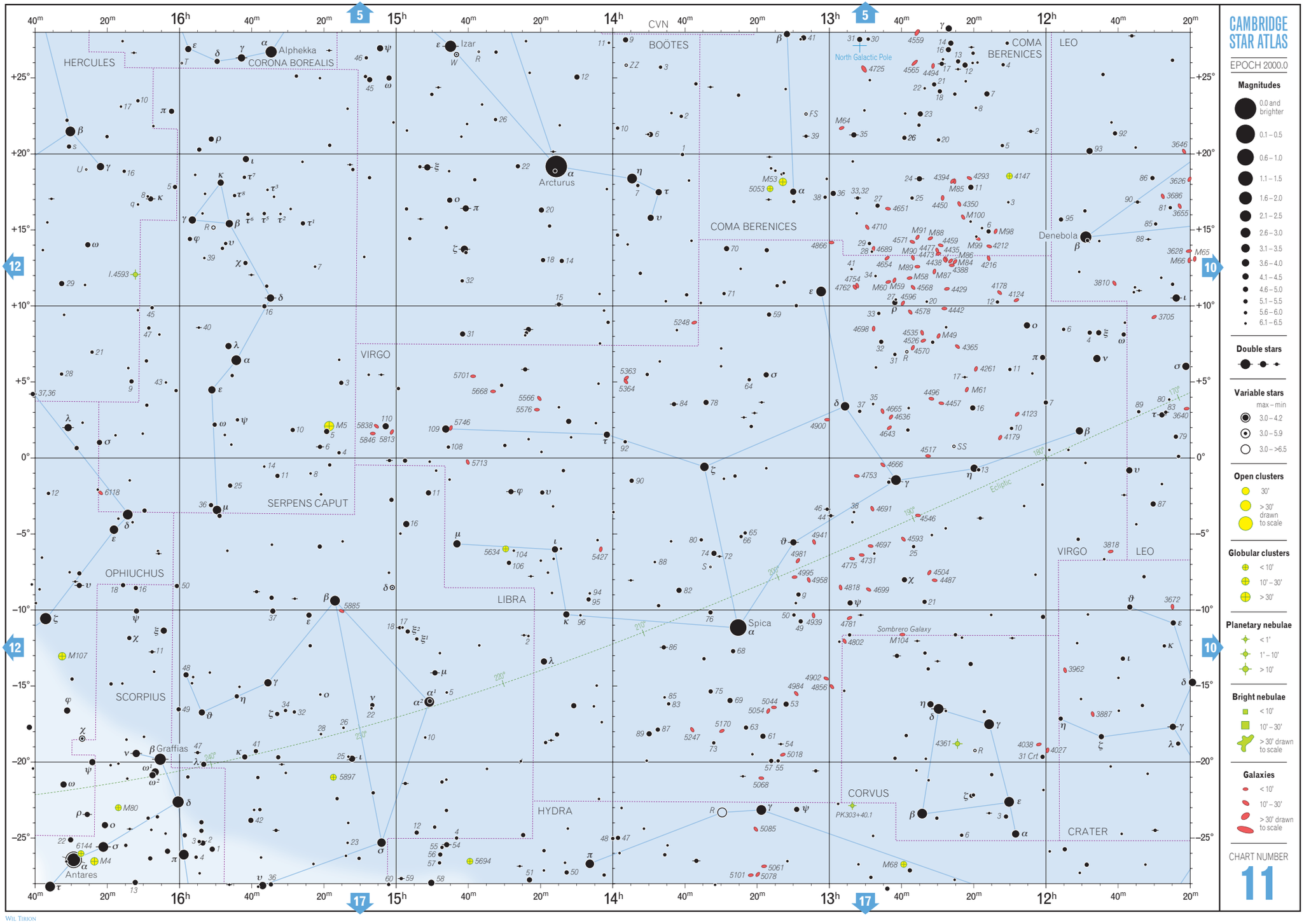

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

0.0 and brighter
0.1 – 0.5
0.6 – 1.0
1.1 – 1.5
1.6 – 2.0
2.1 – 2.5
2.6 – 3.0
3.1 – 3.5
3.6 – 4.0
4.1 – 4.5
4.6 – 5.0
5.1 – 5.5
5.6 – 6.0
6.1 – 6.5

Double stars

Variable stars

max – min
3.0 – 4.2
3.0 – 5.9
3.0 – >6.5

Open clusters

30'
> 30' drawn to scale

Globular clusters

< 10'
10' – 30'
> 30'

Planetary nebulae

< 1'
1' – 10'
> 10'

Bright nebulae

< 10'
10' – 30'
> 30' drawn to scale

Galaxies

< 10'
10' – 30'
> 30' drawn to scale

CHART NUMBER

11

Wil Tirion

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Chart 12 *RA 16h to 20h, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
U	Her	16 25.8	+18 54	6.5–13.4	M	406.1	M
χ	Oph	16 27.0	–18 27	4.2–5.0	Irr	—	M
V1010	Oph	16 49.5	–15 40	6.1–7.0	EB	0.66	A
S	Her	16 51.9	+14 56	6.4–13.8	M	307.4	M
R	Oph	17 17.8	–16 06	7.0–13.8	M	302.6	M
α	Her	17 14.6	+14 23	2.7–4.0	SR	—	M
U	Oph	17 16.5	+01 13	5.9–6.6	EA	1.68	B
Y	Sgr	18 21.4	–18 52	5.4–6.1	Cep	5.77	F
59	Ser	18 27.2	+00 12	4.9–5.9	?	—	G + A
U	Sgr	18 31.9	–19 07	6.3–7.1	Cep	6.74	F – G
X	Oph	18 38.3	+08 50	5.9–9.2	M	334.4	M + K
V3879	Sgr	18 42.9	–19 17	6.1–6.6	SR	50:	M
R	Sct	18 47.5	–05 42	4.5–8.2	RV	140.1	G – K
FF	Aql	18 18.2	+17 22	5.2–5.7	Cep	4.47	F
V	Aql	19 04.4	–05 41	6.6–8.4	SR	353	K
R	Aql	19 06.4	+08 14	5.5–12.0	M	284.2	M
U	Sge	19 18.8	+19 37	6.6–9.2	EA	3.38	B + K
U	Aql	19 29.4	–07 03	6.1–6.9	Cep	7.02	F – G
η	Aql	19 52.5	+01 00	3.5–4.4	Cep	7.17	F – G
V505	Sgr	19 53.1	–14 36	6.5–7.5	EA	1.18	A + F
S	Sge	19 56.0	+16 38	5.3–6.0	Cep	8.38	F – G

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
β	Sco	16 05.4	–19 48	21	13.6	2.6 + 4.9	Graffias
				132	0.5	10.3	
11	Sco	16 07.6	–12 45	257	3.3	5.6 + 9.9	
κ	Her	16 08.1	–17 03	12	28.4	5.3 + 6.5	
ν	Sco	16 12.0	–19 28	337	41.1	4.3 + 6.8	
				3	0.9	6.8	
				51	2.3	7.8	
υ	Oph	16 27.8	–08 22	95	1.0	4.6 + 7.8	
λ	Oph	16 30.9	+01 59	30	1.5	4.2 + 5.2	Binary, 129.9 years
37, 36	Her	16 40.6	+04 13	230	69.8	5.8 + 7.0	
19	Oph	16 47.2	+02 04	89	23.4	6.1 + 9.4	
η	Oph	17 10.4	–15 43	237	0.6	3.0 + 3.5	Binary, 84.3 years
α	Her	17 14.6	+14 23	104	4.6	2.9 v + 5.4	Rasalgethi; var.; bin., 3,600 y.
41	Oph	17 16.6	–00 27	346	1.0	4.8 + 7.8	
ν	Ser	17 20.8	–12 51	28	46.3	4.3 + 8.3	
53	Oph	17 34.6	+09 35	191	41.2	5.8 + 8.5	
τ	Oph	18 03.1	–08 11	283	1.7	5.2 + 5.9	Binary, 280 years
				127	100.3	9.3	
70	Oph	18 05.5	+02 30	148	3.8	4.2 + 6.0	Binary, 88.1 years
59	Ser	18 27.2	+00 12	318	3.8	5.3 + 7.6	
ϑ	Ser	18 56.2	+04 12	104	22.3	4.5 + 5.4	
23	Aql	19 18.5	+01 05	5	3.1	5.3 + 9.3	
π	Aql	19 48.7	+11 49	110	1.4	6.1 + 6.9	
57	Aql	19 54.6	–08 14	170	35.7	5.8 + 6.5	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
I.4665		Oph	17 46.3	+05 43	4.2	41	30	
6494	M23	Sgr	17 56.8	–19 01	5.5	27	150	
6595		Sgr	18 17.0	–19 53	7.0	11	30	
—	M24	Sgr	18 16.9	–18 29	4.5	90	—	Star cloud
6604		Ser	18 18.1	–12 14	6.5	2	30	
6613	M18	Sgr	18 19.9	–17 08	6.9	9	20	
6633		Oph	18 27.7	+06 34	4.6	27	30	

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
I.4725	M25	Sgr	18 31.6	–19 15	4.6	32	30	
6645		Sgr	18 32.6	–16 54	8.5	10	40	
I.4756		Ser	18 39.0	+05 27	5.4	52	80	
6694	M26	Sct	18 45.2	–09 24	8.0	15	30	
6705	M11	Sct	18 51.1	–06 16	5.8	14	500	Wild Duck Cluster
6709		Aql	18 51.5	+10 21	6.7	13	40	
6716		Sgr	18 54.6	–19 53	6.9	7	20	
6738		Aql	19 01.4	+11 36	8.3	15	—	
6755		Aql	19 07.8	+04 14	7.5	15	100	
—	H 20	Sge	19 53.1	+18 20	7.7	7	15	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
6171	M107	Oph	16 32.5	–13 03	8.1	10.0
6218	M12	Oph	16 47.2	–01 57	6.6	14.5
6254	M10	Oph	16 57.1	–04 06	6.6	15.1
6333	M9	Oph	17 19.2	–18 31	7.9	9.3
6342		Oph	17 21.2	–19 35	9.9	3.0
6356		Oph	17 23.6	–17 49	8.4	7.2
6366		Oph	17 27.7	–05 05	10.0	8.3
6402	M14	Oph	17 37.6	–03 15	7.6	11.7
6517		Oph	18 01.8	–08 58	10.3	4.3
6535		Ser	18 03.8	–00 18	10.6	3.6
6539		Ser	18 04.8	–07 35	9.6	6.9
I.1276		Ser	18 10.7	–07 12	10.3	7.1
6712		Sct	18 53.1	–08 42	8.2	7.2
6760		Aql	19 11.2	+01 02	9.1	6.6
6838	M71	Sge	19 53.8	+18 47	8.3	7.2

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
6611	M16	Ser	18 18.8	–13 47	E	35 × 28	—	Eagle Nebula, contains cluster
6618	M17	Sgr	18 20.8	–16 11	E	46 × 37	—	Omega Nebula, contains cluster

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
I.4593		Her	16 12.2	+12 04	10.9	12/120	11.3
6309		Oph	17 14.1	–12 55	10.8	14/66	14.4
6537		Sgr	18 05.2	–19 51	12.5	9	—
6572		Oph	18 12.1	+06 51	9.0	8	13.6
6741		Aql	19 02.6	–00 27	10.8	6	14.7
6751		Aql	19 05.9	–06 00	12.5	20	13.9
6781		Aql	19 18.4	+06 33	11.8	109	15.0
6790		Aql	19 23.2	+01 31	10.2	7	13.5
6803		Aql	19 31.3	+10 03	11.3	6	15.2
—	PK52–2.2	Aql	19 39.2	+15 57	12.6	10	—
6818		Sgr	19 44.0	–14 09	9.9	17	13.1

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
6118		Ser	16 21.8	–02 17	12.3	4.7 × 2.3	Sb
6384		Oph	17 32.4	+07 04	10.6	6.0 × 4.3	Sb
6822		Sgr	19 44.9	–14 48	9.4	10.2 × 9.5	Irr

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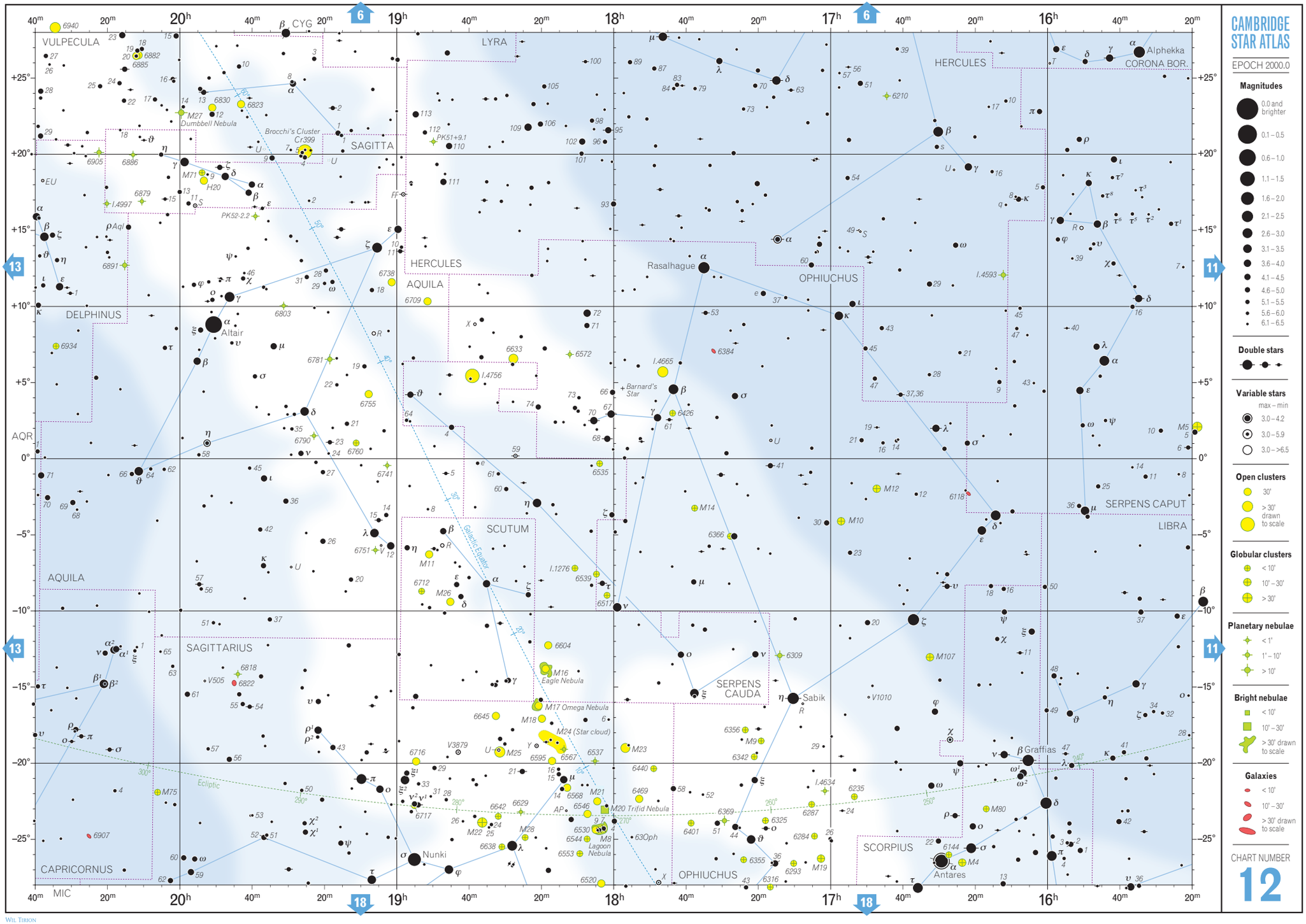

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

12

Wil Tirion

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Chart 13 *RA 20h to 0h, declination +20° to –20°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
EU	**Del**	20 37.9	+18 16	5.8–6.9	**SR**	59.5	M
U	**Del**	20 45.5	+15 05	5.6–7.5	**SR**	110:	M
EP	**Aqr**	21 46.5	–02 13	6.4–6.8	**SR**	55:	M
AG	**Peg**	21 51.0	+12 38	6.0–9.4	**ZA**	830.1	M
R	**Aqr**	23 43.8	–15 17	5.8–12.4	**M**	387.0	M
TX	**Psc**	23 46.4	+03 29	4.8–5.2	**Irr**	—	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
15	**Sge**	20 04.1	+17 04	276	190.7	5.9 + 9.1	
				320	203.7	6.8	
α^1	**Cap**	20 17.6	–12 30	221	45.4	4.2 + 9.2	
α^2	**Cap**	20 18.1	–12 33	172	6.6	3.6 + 10.4	Algedi
α^2, α^1	**Cap**	20 18.1	–12 33	291	377.7	3.6 + 4.2	
σ	**Cap**	20 19.4	–19 07	179	55.9	5.5 + 9.0	
π	**Cap**	20 27.3	–18 13	148	3.2	5.3 + 8.9	
ρ	**Cap**	20 28.9	–17 49	158	0.5	5.0 + 10.0	
1	**Del**	20 30.3	+10 54	346	0.9	6.1 + 8.1	
γ	**Del**	20 46.7	+16 07	268	9.6	4.5 + 5.5	
13	**Del**	20 47.8	+06 00	194	1.6	5.6 + 9.2	
1	**Equ**	20 59.1	+04 18	284	0.8	6.0 + 6.3	= ε Eql; binary 101.4 years
γ	**Equ**	21 10.3	+10 08	268	1.9	4.7 + 11.5	
				5	47.7	12.5	
				153	352.5	5.9	
ξ	**Aqr**	22 28.8	–00 01	192	2.1	4.3 + 4.5	Binary, 856 years
				191	41.0	7.5	
37	**Peg**	22 30.0	+04 26	118	0.7	5.8 + 7.1	Binary, 140 years
107	**Aqr**	23 46.0	–18 41	136	6.6	5.7 + 6.7	

Open cluster

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
6994	M73	**Aqr**	20 58.9	–12 38	8.9	2.8	4	Not a real cluster

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
6934		**Del**	20 34.2	+07 24	8.9	5.9
6981	M72	**Aqr**	20 53.5	–12 32	9.4	5.9
7006		**Del**	21 01.5	+16 11	10.6	2.8
7078	M15	**Peg**	21 30.0	+12 10	6.4	12.3
7089	M2	**Aqr**	21 33.5	–00 49	6.5	12.9
7492		**Aqr**	23 08.4	–15 37	11.5	6.2

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
6879		**Sge**	20 10.5	+16 55	13.0	5	15:	
6886		**Sge**	20 12.7	+19 59	12.2	4	15.7	
6891		**Del**	20 15.2	+12 42	11.7	12/74	12.4	
I.4997		**Sge**	20 20.2	+16 45	11.6	2	13:	
7009		**Aqr**	21 04.2	–11 22	8.3	25/100	11.5	Saturn Nebula

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
7448		**Peg**	23 00.1	+15 59	11.7	2.7 × 1.3	**Sc**
7479		**Peg**	23 04.9	+12 19	11.0	4.1 × 3.2	**SBb**
7606		**Aqr**	23 19.1	–08 29	10.8	5.8 × 2.6	**Sb**
7723		**Aqr**	23 38.9	–12 58	11.1	3.6 × 2.6	**Sb**
7727		**Aqr**	23 39.9	–12 18	10.7	4.2 × 3.4	**SBa**

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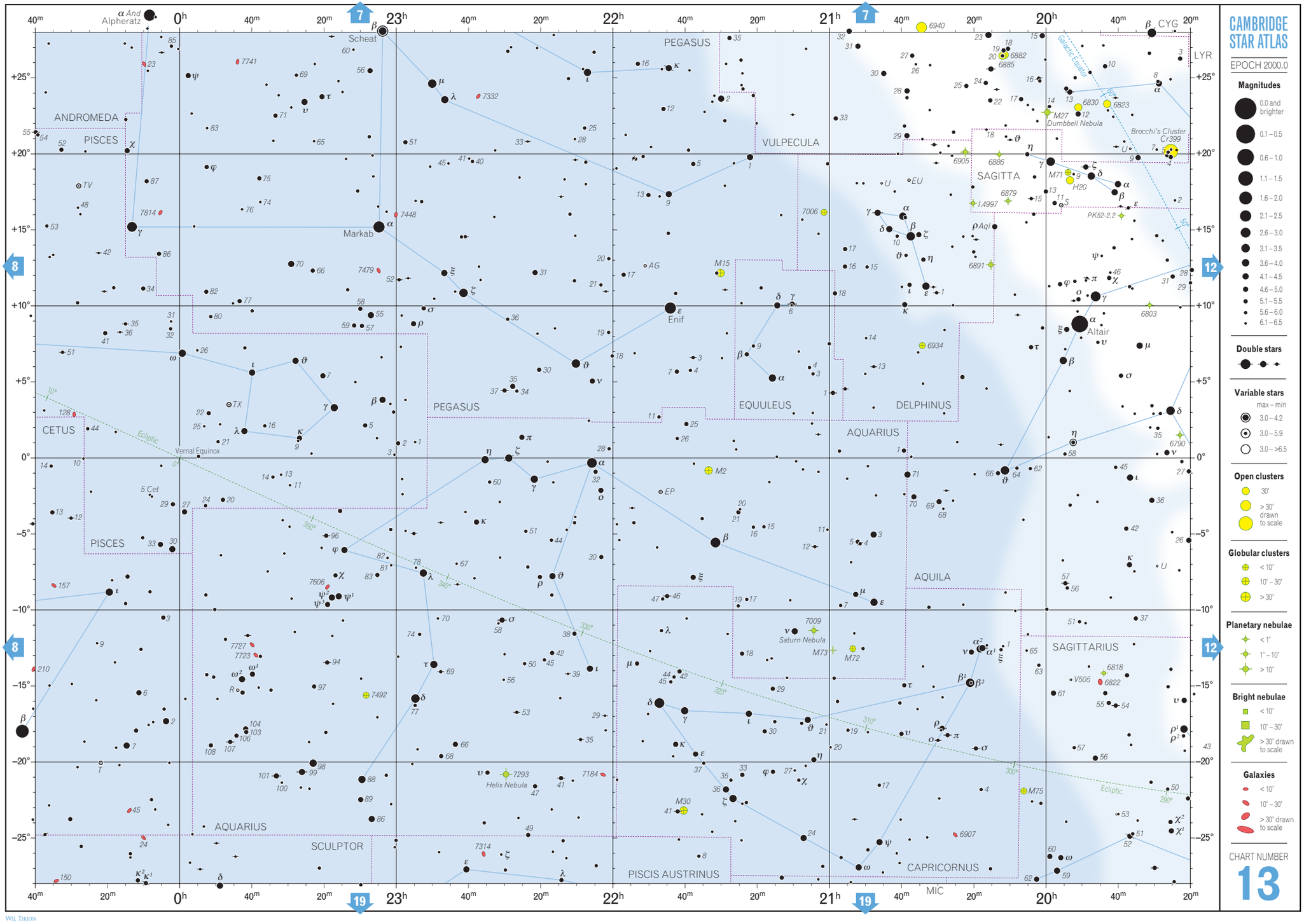

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

13

Wil Tirion

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Chart 14 *RA 0h to 4h, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
S	Scl	00 15.4	–32 03	5.5–13.6	M	365.3	M
T	Cet	00 21.8	–20 03	5.0–6.9	SR	158.9	M
ζ	Phe	01 08.4	–55 15	3.9–4.4	EA	1.67	B
R	Scl	01 27.0	–32 33	9.1–12.8 p	SR	370	M
AA	Cet	01 59.0	–22 55	6.0–6.5	EW	0.54	F
R	Hor	02 53.9	–49 53	4.7–14.3	M	404.0	M
V	Hor	03 03.5	–58 56	8.7–9.8 p	SR	—	M
TW	Hor	03 12.6	–57 19	5.3–6.0	SR	158:	K

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
κ¹	Scl	00 09.3	–27 59	265	1.4	6.1 + 6.2	
β	Tuc	00 31.5	–62 58	169	27.1	4.4 + 4.8	
ξ	Phe	00 41.8	–56 30	253	13.2	5.8 + 10.2	
λ¹	Scl	00 42.7	–38 28	3	0.5	6.7 + 7.0	
β	Phe	01 06.1	–46 43	346	1.4	4.0 + 4.2	
p	Eri	01 39.8	–56 12	191	11.5	5.8 + 5.8	Binary, 483.7 years
ε	Scl	01 45.6	–25 03	23	4.7	5.4 + 8.6	Binary, 1192 years
ω	For	02 33.8	–28 14	244	10.8	5.0 + 7.7	
η²	For	02 50.2	–35 51	14	5.0	5.9 + 10.1	
ϑ	Eri	02 58.3	–40 18	88	8.2	3.4 + 4.5	
α	For	03 12.1	–28 59	299	5.1	4.0 + 7.0 v	Binary, 314 years
τ⁴	Eri	03 19.5	–21 45	288	5.7	3.7 + 9.2	
				236	160.2	9.7	
χ³	For	03 28.2	–35 51	248	6.3	6.5 + 10.5	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
288		Scl	00 52.8	–26 35	8.1	13.8
1261		Hor	03 12.3	–55 13	8.4	6.9

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
1360		For	03 33.3	–25 51	9.4	390	11.4

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
24		Scl	00 09.9	–24 58	11.5	5.5 × 1.6	Sb	
45		Cet	00 14.1	–23 11	10.4	8.1 × 5.8	S	
55		Scl	00 14.9	–39 11	8.2	32.4 × 6.5	SB	
134		Scl	00 30.4	–33 15	10.1	8.1 × 2.6	SBb	
150		Scl	00 34.3	–27 48	11.1	4.2 × 2.3	S	
247		Cet	00 47.1	–20 46	8.9	20.0 × 7.4	Sc	
253		Scl	00 47.6	–25 17	7.1	25.1 × 7.4	Sc	
289		Scl	00 52.7	–31 12	11.6	3.7 × 2.7	Sb	
300		Scl	00 54.9	–37 41	8.7	20.0 × 14.8	Sd	
—	E 351–30	Scl	00 59.9	–33 42	10.5	35: × 29:	dE3	Sculptor Dwarf
578		Cet	01 30.5	–22 40	10.9	4.8 × 3.2	Sc	
613		Scl	01 34.3	–29 25	10.0	5.8 × 4.6	SBb	
685		Eri	01 47.8	–52 47	11.8	4.1 × 4.0	SBc	
908		Cet	02 23.1	–21 14	10.2	5.5 × 2.8	SBb	
986		For	02 33.6	–39 02	11.0	3.7 × 2.8	Sc	
—	E 356–4	For	02 39.9	–34 32	9.0	63: × 48:	dE3	Fornax Dwarf
1097		For	02 46.3	–30 17	9.3	9.3 × 6.6	SBb	
1187		Eri	03 02.6	–22 52	10.9	5.0 × 4.0	SBc	
1201		For	03 04.1	–26 04	10.6	4.4 × 2.8	Sa	
1232		Eri	03 09.8	–20 35	9.9	7.8 × 6.9	Sc	
1249		Hor	03 10.1	–53 21	11.7	5.2 × 2.7	SBc	
1255		For	03 13.5	–25 44	11.1	4.1 × 2.8	Sc	
1291		Eri	03 17.3	–41 08	8.5	10.5 × 9.1	SBa	
1302		For	03 19.9	–26 04	11.5	4.4 × 4.2	SBa	
1316		For	03 22.7	–37 12	8.9	7.1 × 5.5	SB0	
1326		For	03 23.9	–36 28	10.5	4.0 × 3.0	SB0	
1332		Eri	03 26.3	–21 20	10.3	4.6 × 1.7	E7	
1344		For	03 28.3	–31 04	10.3	3.9 × 2.3	E3	
1350		For	03 31.1	–33 38	10.5	4.3 × 2.4	SBb	
1365		For	03 33.6	–36 08	9.5	9.8 × 5.5	SBb	
1371		For	03 35.0	–24 56	11.5	5.4 × 4.0	SBa	
1380		For	03 36.5	–34 59	11.1	4.9 × 1.9	S0	
1385		For	03 37.5	–24 30	11.2	3.0 × 2.0	Sc	
1395		Eri	03 38.5	–23 02	11.3	3.2 × 2.5	E3	
1398		For	03 38.9	–26 20	9.7	6.6 × 5.2	SBb	
1399		For	03 38.5	–35 27	9.9	3.2 × 3.1	E1p	
1411		Hor	03 38.8	–44 05	11.9	2.8 × 2.3	S0	
1404		For	03 38.9	–35 35	10.3	2.5 × 2.3	E1	
1433		Hor	03 42.0	–47 13	10.0	6.8 × 6.0	SBa	
1425		For	03 42.2	–29 54	11.7	5.4 × 2.7	Sb	
1448		Hor	03 44.5	–44 39	11.3	8.1 × 1.8	Sc	
1493		Hor	03 57.5	–46 12	11.8	2.6 × 2.3	SBc	

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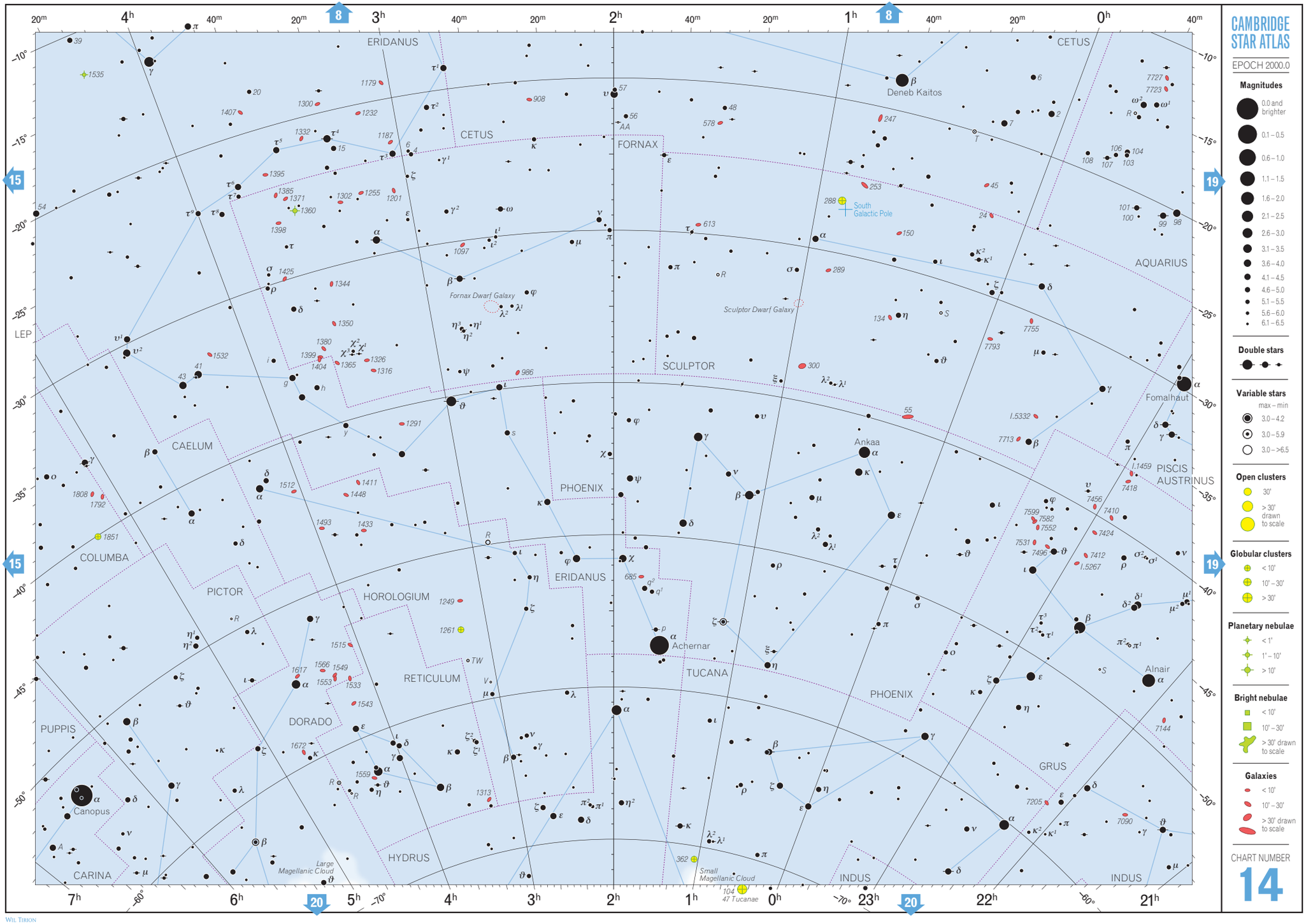

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

14

Wil Tirion

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Chart 15 *RA 4h to 8h, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
R	**Ret**	04 33.5	–63 02	6.5–14.0	**M**	278.3	M
R	**Dor**	04 36.8	–62 05	4.8–6.6	**SR**	338:	M
R	**Pic**	04 46.2	–49 15	6.7–10.0	**SR**	164.2	M
β	**Dor**	05 33.6	–62 29	3.5–4.1	**Cep**	9.84	F – G
S	**Lep**	06 05.8	–24 12	6.0–7.6	**SR**	90	B
L^2	**Pup**	07 13.5	–44 39	2.6–6.2	**SR**	140.4	M
ω	**CMa**	07 14.8	–26 46	3.6–4.2	**Irr**	—	B
V	**Pup**	07 58.2	–49 15	4.4–4.9	**EB**	1.45	B + B

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
γ	**Cae**	05 40.4	–25 29	308	2.9	4.6 + 8.1	
ϑ	**Pic**	05 24.8	–52 19	287	38.2	6.3 + 6.8	
β	**Lep**	05 28.2	–20 46	330	2.5	2.8 + 7.3	Nihal
γ	**Lep**	05 44.5	–22 27	350	96.3	3.7 + 6.3	
μ	**Pic**	06 32.0	–58 45	231	2.4	5.8 + 9.0	
17	**CMa**	06 55.0	–20 24	147	44.4	5.8 + 9.3	
π	**CMa**	06 55.6	–20 08	18	11.6	4.7 + 9.7	
ε	**CMa**	06 58.6	–28 58	161	7.5	1.5 + 7.4	Adhara
σ	**Pup**	07 29.2	–43 18	74	22.3	3.3 + 9.4	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
2287	M41	**CMa**	06 47.0	–20 44	4.5	38	80	
2354		**CMa**	07 14.3	–25 44	6.5	20	100	
2362		**CMa**	07 18.8	–24 57	4.1	8	60	
—	Cr 135	**Pup**	07 17.0	–36 50	2.1	50	—	Contains π Pup
2367		**CMa**	07 20.1	–21 56	7.9	3.5	30	
2383		**CMa**	07 24.8	–20 56	8.4	6	40	
2384		**CMa**	07 25.1	–21 02	7.4	2.5	15	
2421		**Pup**	07 36.3	–20 37	8.3	10	70	
2439		**Pup**	07 40.8	–31 39	6.9	10	80	
2447	M93	**Pup**	07 44.6	–23 52	6.2	22	80	
2451		**Pup**	07 45.4	–37 58	2.8	45	40	Contains c Pup
2453		**Pup**	07 47.8	–27 14	8.3	5	30	
2477		**Pup**	07 52.3	–38 33	5.8	27	160	
2467		**Pup**	07 52.6	–26 23	7.1	16	50	Contains nebula
2482		**Pup**	07 54.9	–24 18	7.3	12	40	
2489		**Pup**	07 56.2	–30 04	7.9	8	45	
2516		**Car**	07 58.3	–60 53	3.8	30	80	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
1851		**Col**	05 14.1	–40 03	7.3	11.0
1904	M79	**Lep**	05 24.5	–24 33	8.0	8.7
2298		**Pup**	06 49.0	–36 00	9.4	6.8

Bright diffuse nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
2467		**Pup**	07 52.6	–26 24	**E**	8 × 7	9.2	In cluster

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
1512		**Hor**	04 03.9	–43 21	10.6	4.0 × 3.2	**SBa**
1515		**Dor**	04 04.1	–54 06	11.0	5.4 × 1.3	**SBb**
1532		**Eri**	04 12.1	–32 52	11.1	5.6 × 1.8	**Sb**
1543		**Ret**	04 12.8	–57 44	10.6	3.9 × 2.1	**SB0**
1533		**Dor**	04 16.2	–55 47	9.5	4.1 × 2.8	**S0**
1549		**Dor**	04 15.7	–55 36	9.9	3.7 × 3.2	**E0**
1553		**Dor**	04 16.2	–55 47	9.5	4.1 × 2.3	**S0**
1559		**Ret**	04 17.6	–62 47	10.5	3.3 × 2.1	**SBc**
1566		**Dor**	04 20.0	–54 56	9.4	7.6 × 6.2	**SBb**
1617		**Dor**	04 31.7	–54 36	10.4	4.7 × 2.4	**SBa**
1672		**Dor**	04 45.7	–59 15	11.0	4.8 × 3.9	**SBb**
1744		**Lep**	05 00.0	–26 01	11.2	6.8 × 4.1	**SBc**
1792		**Col**	05 05.2	–37 59	10.2	4.0 × 2.1	**Sb**
1808		**Col**	05 07.7	–37 31	9.9	7.2 × 4.1	**SBa**
1964		**Lep**	05 33.4	–21 57	10.8	6.2 × 2.5	**Sb**
2090		**Col**	05 47.0	–34 14	11.8	4.5 × 2.3	**Sc**
2207		**CMa**	06 16.4	–21 22	10.7	4.3 × 2.9	**Sc**
2217		**CMa**	06 21.7	–27 14	10.4	4.8 × 4.4	**SBa**
2223		**CMa**	06 24.6	–22 50	11.4	3.3 × 3.0	**SBb**
2280		**CMa**	06 44.8	–27 38	11.8	5.6 × 3.2	**Sb**

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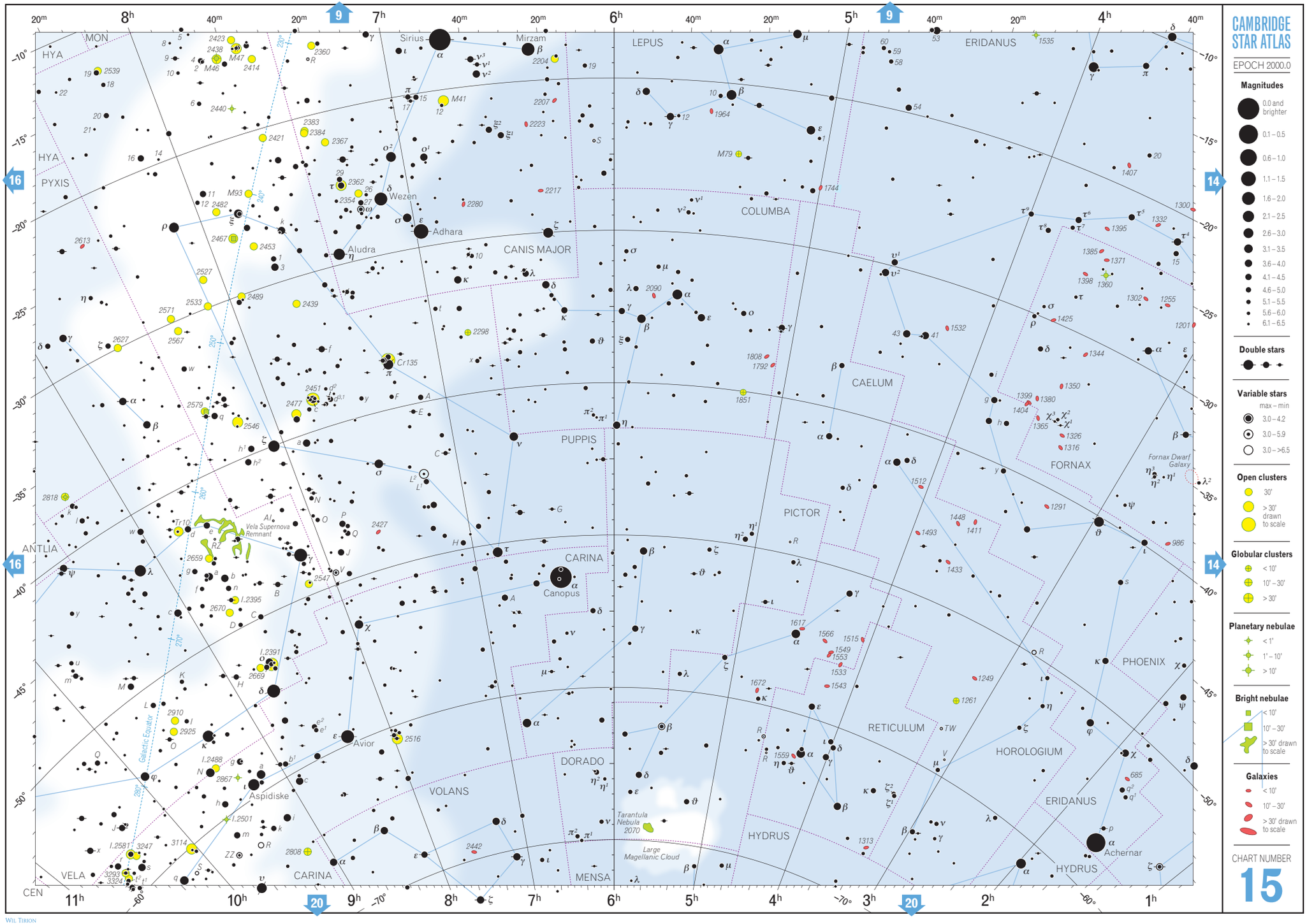

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

15

Wil Tirion

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Chart 16 *RA 8h to 12h, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
AI	Vel	08 14.1	–44 34	6.4–7.1	δSct	0.11	A – F
RZ	Vel	08 37.0	–44 07	6.4–7.6	Cep	20.39	G
R	Car	09 32.2	–62 47	3.9–10.5	M	308.7	M
ZZ	Car	09 45.2	–62 30	3.3–4.2	Cep	35.53	F – K
Y	Hya	09 51.1	–23 01	8.3–12.0 p	SR	302.8	K
S	Car	10 09.4	–61 33	4.5–9.9	M	149.5	K – M
U	Ant	10 35.2	–39 34	8.1–9.7 p	Irr	—	K
η	Car	10 45.1	–59 41	–0.8–7.9	SD	—	Pec
U	Car	10 57.8	–59 44	5.7–7.0	Cep	38.76	F – G
ER	Car	11 09.7	–58 50	6.6–7.1	Cep	7.72	F – G
o1	Cen	11 31.8	–59 27	4.7–5.5	SR	200:	G

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes
γ	Vel	08 09.5	–47 20	220	41.2	1.9 + 4.2
				151	62.3	8.3
				141	93.5	9.1
				146	1.8	12.5
δ	Vel	08 44.7	–54 43	153	2.6	2.1 + 5.1
H	Vel	08 56.3	–52 43	339	2.7	4.8 + 7.4
κ	Pyx	09 08.0	–25 52	263	2.1	4.6 + 9.8
ξ1	Ant	09 30.8	–31 53	212	8.0	6.2 + 7.1
δ	Ant	10 29.6	–30 36	226	11.0	5.6 + 9.6
μ	Vel	10 46.8	–49 25	58	2.5	2.7 + 6.4 Binary, 116.2 years
β	Hya	11 52.9	–33 54	8	0.9	4.7 + 5.5

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
2527		Pup	08 05.3	–28 10	6.5	22	40	
2533		Pup	08 07.0	–29 54	7.6	3.5	60	
2547		Vel	08 10.7	–49 16	4.7	20	80	
2546		Pup	08 12.4	–37 38	6.3	41	40	
2567		Pup	08 18.6	–30 38	7.4	10	40	
2571		Pup	08 18.9	–29 44	7.0	13	30	
2579		Pup	08 21.1	–36 11	7.5	10	20	
2627		Pyx	08 37.3	–29 57	8.4	11	60	
I.2391		Vel	08 40.2	–53 04	2.5	50	30	o Velorum Cluster
I.2395		Vel	08 41.1	–48 12	4.6	8	40	
2669		Vel	08 44.9	–52 58	6.1	12	40	
2670		Vel	08 45.5	–48 47	7.8	9	30	
—	Tr 10	Vel	08 47.8	–42 29	4.6	15	40	
2818		Pyx	09 16.0	–36 37	8.2	9	40	Cont. planetary neb.
I.2488		Vel	09 27.6	–56 59	7.4	15	70	
2910		Vel	09 30.4	–52 54	7.2	5	30	
2925		Vel	09 33.7	–53 26	8.3	12	40	
3114		Car	10 02.7	–60 07	4.2	35	100	
3247		Car	10 25.9	–57 56	7.6	7	20	
I.2581		Car	10 27.4	–57 38	4.3	8	25	
3293		Car	10 35.8	–58 14	4.7	6	30	
3324		Car	10 37.3	–58 38	6.7	6	10	
I.2602		Cep	10 43.2	–64 24	1.9	50	60	Southern Pleiades
3532		Car	11 06.4	–58 40	3.0	55	150	

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
3572		Car	11 10.4	–60 14	6.6	7	35	
3590		Car	11 12.9	–60 47	8.2	4	25	
I.2714		Car	11 17.9	–62 42	8.2	12	100	
—	Mel 105	Car	11 19.5	–63 30	70	4	70	
3680		Cen	11 25.7	–43 15	7.6	12	30	
3766		Cen	11 36.1	–61 37	5.3	12	100	
I.2944		Cen	11 36.6	–63 02	4.5	15	30	λ Centauri Cluster
3960		Cen	11 50.9	–55 42	8.3	7	45	

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
2808		Car	09 12.0	–64 52	6.3	13.8
3201		Vel	10 17.6	–46 25	6.8	18.2

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
2579		Pup	08 20.9	–36 13	E	2	1.2	
—	Gum 12	Vel	08 30:	–45:	E	1200 × 720		Vela SNR
3372		Car	10 43.8	–59 52	E	120 × 120	6.2	Eta Carinae Nebula

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
2818		Pyx	09 16.0	–36 38	13.0	38		In open cluster
2867		Car	09 21.4	–58 19	9.7	11	13.6	
I.2501		Car	09 38.8	–60 05	11.3	25		
3132		Vel	10 07.7	–40 26	8.2	47	10.1	
3211		Car	10 17.8	–62 40	11.8	12		
3918		Cen	11 50.3	–57 11	8.4	12	10.8	

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
2613		Pyx	08 33.4	–22 58	10.4	7.2 × 2.1	Sb
2784		Hya	09 12.3	–24 10	10.1	5.1 × 2.3	S0
2835		Hya	09 17.9	–22 21	11.1	6.3 × 4.4	S
2935		Hya	09 36.7	–21 08	11.9	3.5 × 3.0	SBb
2997		Ant	09 45.6	–31 11	10.6	8.1 × 6.5	Sc
3109		Hya	10 03.1	–26 09	10.4	14.5 × 3.5	Irr
3223		Ant	10 21.6	–34 16	11.8	4.1 × 2.6	Sb
3256		Vel	10 27.8	–43 54	11.3	3.5 × 2.0	Pec
3309		Hya	10 36.6	–27 31	11.9	1.9 × 1.7	E0
3511		Crt	11 03.4	–23 05	11.6	5.4 × 2.2	Sc
3513		Crt	11 03.8	–23 15	12.0	2.8 × 2.3	SBc
3557		Cen	11 10.0	–37 32	10.4	4.0 × 2.7	E3
3585		Hya	11 13.3	–26 45	10.0	2.9 × 1.6	E5
3621		Hya	11 18.3	–32 49	9.9	10.0 × 6.5	Sc
3904		Hya	11 49.2	–29 17	11.0	2.2 × 1.7	E2
3923		Hya	11 51.0	–28 48	10.1	2.9 × 1.9	E3

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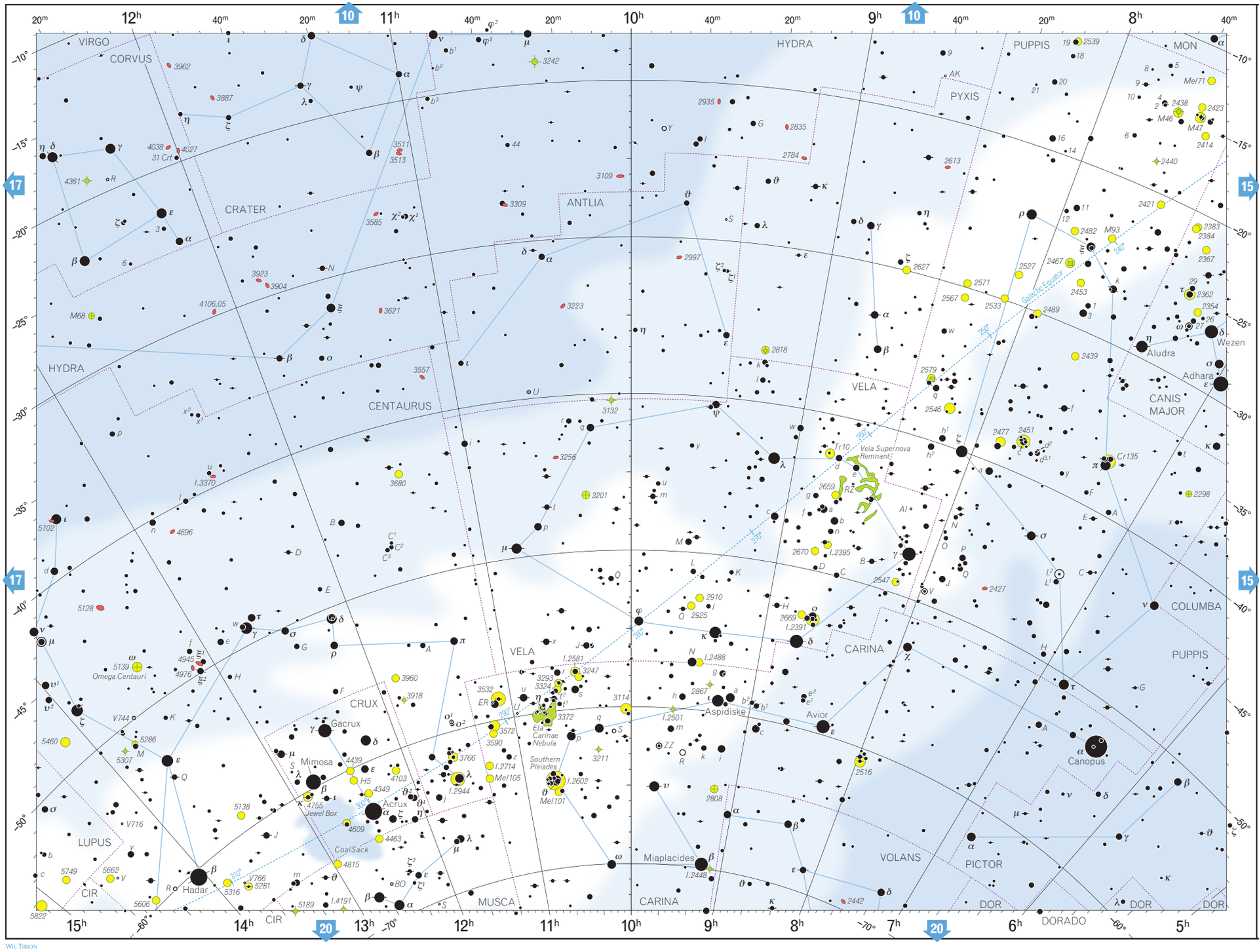

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

0.0 and brighter
0.1 – 0.5
0.6 – 1.0
1.1 – 1.5
1.6 – 2.0
2.1 – 2.5
2.6 – 3.0
3.1 – 3.5
3.6 – 4.0
4.1 – 4.5
4.6 – 5.0
5.1 – 5.5
5.6 – 6.0
6.1 – 6.5

Double stars

Variable stars

max – min
3.0 – 4.2
3.0 – 5.9
3.0 – >6.5

Open clusters

30'
> 30' drawn to scale

Globular clusters

< 10'
10' – 30'
> 30'

Planetary nebulae

< 1'
1' – 10'
> 10'

Bright nebulae

< 10'
10' – 30'
> 30' drawn to scale

Galaxies

< 10'
10' – 30'
> 30' drawn to scale

CHART NUMBER

16

Wil Tirion

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Chart 17 *RA 12ʰ to 16ʰ, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
S	Cru	12 54.4	–58 26	6.2–6.9	Cep	4.69	F – G
R	Hya	13 29.7	–23 17	3.5–10.9	M	389.6	M
V744	Cen	13 40.0	–49 57	5.1–6.6	SR	90:	M
T	Cen	13 41.8	–33 36	5.5–9.0	SR	90.44	K – M
V766	Cen	13 47.2	–62 35	6.2–7.5	SD?	—	G
μ	Cen	13 49.6	–42 28	2.9–3.5	Irr	—	B
V716	Cen	14 13.7	–54 38	6.0–6.5	EB	1.49	B
R	Cen	14 16.6	–59 55	5.3–11.8	M	546.2	M
GG	Lup	15 32.2	–23 53	5.5–6.0	SR	—	M
R	Nor	15 36.0	–49 30	6.5–13.9	M	492.7	M
T	Nor	15 44.1	–54 59	6.2–13.6	M	242.6	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
α	Cru	12 26.6	–63 06	115	4.4	1.4 + 1.9	Acrux
				202	90.1	4.9	
γ	Cru	12 31.2	–57 07	31	110.6	1.6 + 6.7	Gacrux
				82	155.2	9.5	
γ	Cen	12 41.5	–48 58	347	1.0	2.9 + 2.9	Binary, 84.5 years
ι	Cru	12 45.6	–60 59	22	26.9	4.7 + 9.5	
μ	Cru	12 54.6	–57 11	17	34.9	4.3 + 5.3	
3	Cen	13 51.8	–33 00	108	7.9	4.5 + 6.0	
4	Cen	13 53.2	–31 56	185	14.9	4.7 + 8.4	
β	Cen	14 03.8	–60 22	251	1.3	0.7 + 3.9	Hadar
α	Cen	14 39.6	–60 50	222	14.1	0.0 + 1.2	Rigil Kent; binary, 79.9 years
				211:	7860 (131')	11.0	Proxima Centauri
α	Cir	14 42.5	–64 59	232	15.7	3.2 + 8.6	
54	Hya	14 46.0	–25 27	126	8.6	5.1 + 7.1	
59	Hya	14 58.7	–27 39	80	0.3	6.3 + 6.6	Binary, 339.3 years
π	Lup	15 05.1	–47 03	73	1.4	4.6 + 4.7	
κ	Lup	15 11.9	–48 44	144	26.8	3.9 + 5.8	
μ	Lup	15 18.5	–47 53	142	1.2	5.1 + 5.2	
				130	23.7	7.2	
γ	Cir	15 23.4	–59 19	20	0.7	5.1 + 5.5	Binary, 180 years
2	Sco	15 53.6	–25 20	274	2.5	4.7 + 7.4	
ξ	Lup	15 56.9	–33 58	49	10.4	5.3 + 5.8	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
4103		Cru	12 06.7	–61 15	7.4	7	45	
4349		Cru	12 24.5	–61 54	7.4	16	30	
4439		Cru	12 28.4	–60 06	8.4	4		
—	H 5	Cru	12 29.0	–60 46	7.1	6		
4463		Mus	12 30.0	–64 48	7.2	5	30	
4609		Cru	12 42.3	–62 58	6.9	5	40	
4755		Cru	12 53.6	–60 20	4.2	10	50	Jewel Box, κ Crucis
4815		Mus	12 58.0	–64 57	8.6	3	100	
5138		Cen	13 27.3	–59 01	7.6	8	40	
5281		Cen	13 46.6	–62 54	5.9	5	40	
5316		Cen	13 53.9	–61 52	6.0	14	80	
5460		Cen	14 07.6	–48 19	5.6	25	40	
5606		Cen	14 27.8	–59 38	7.7	3	15	
5617		Cen	14 29.8	–60 43	6.3	10	80	

Open clusters *(continued)*

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*
5662		Cen	14 35.2	–56 33	5.5	12	70
5749		Lup	14 48.9	–54 31	8.8	8	30
5822		Lup	15 05.2	–54 21	6.5	40	150
5823		Cir	15 05.7	–55 36	7.9	10	100
5925		Nor	15 27.7	–54 31	8.4	15	120

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	
4590	M68	Hya	12 39.5	–26 45	8.2	12.0	
5139	ω Cen	Cen	13 26.8	–47 29	3.7	36.3	Omega Centauri
5286		Cen	13 46.4	–51 22	7.6	9.1	
5824		Lup	15 04.0	–33 04	9.0	6.2	
5897		Lib	15 17.4	–21 01	8.6	12.6	
5927		Lup	15 28.0	–50 40	8.3	12.0	
5946		Nor	15 35.5	–50 40	9.6	7.1	
5986		Lup	15 46.1	–37 47	7.1	9.8	

Nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
—	Coal Sack	Cru	12 53:	–63:	—	400 × 300	—	Dark nebula
5367		Cen	13 57.7	–39 59	R	4 × 3		

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
—	PK303+40.1	Hya	12 53.6	–22 52	12.0	709	9.6
5307		Cen	13 51.1	–51 12	12.1	13	
I.4406		Cen	14 22.4	–44 09	10.6	28	14.7
5873		Lup	15 12.8	–38 08	13.3	3	13.6
5882		Lup	15 16.8	–45 39	10.5	7	12.0

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type	
4105		Hya	12 06.7	–29 46	12.0	2.4 × 1.9	E2	
4106		Hya	12 06.8	–29 46	11.4	1.9 × 1.5	E0	
I.3370		Cen	12 27.6	–39 20	11.1	2.8 × 2.4	E2	
4696		Cen	12 48.8	–41 19	10.7	3.5 × 3.2	E1	
4945		Cen	13 05.4	–49 28	9.5	20.0 × 4.4	SBc	
4976		Cen	13 08.6	–49 30	10.2	4.3 × 2.6	E4	
5061		Hya	13 18.1	–26 50	11.7	2.6 × 2.3	E2	
5068		Vir	13 18.9	–21 02	10.8	6.9 × 6.3	SBc	
5078		Hya	13 19.8	–27 24	12:	3.2 × 1.7	Sa	
5085		Hya	13 20.3	–24 26	11.9	3.4 × 3.0	Sb	
5101		Hya	13 21.8	–27 26	11.7	5.5 × 4.9	SBa	
5102		Cen	13 22.0	–36 38	9.7	9.3 × 3.5	S0	
5128		Cen	13 25.5	–43 01	7.0	18.2 × 14.5	S0	
I.4296		Cen	13 36.6	–33 58	11.6	2.7 × 2.7	E0	
5236	M83	Hya	13 37.0	–29 52	8.2	11.2 × 10.2	Sc	Southern Pinwheel
5253		Cen	13 39.9	–31 39	10.6	4.0 × 1.7	E5	
5483		Cen	14 10.4	–43 19	12.0	3.1 × 2.8	Sc	
5530		Lup	14 18.5	–43 24	11.9	4.1 × 2.2	Sb	
5643		Lup	14 32.7	–44 10	10.7	4.6 × 4.1	SBc	

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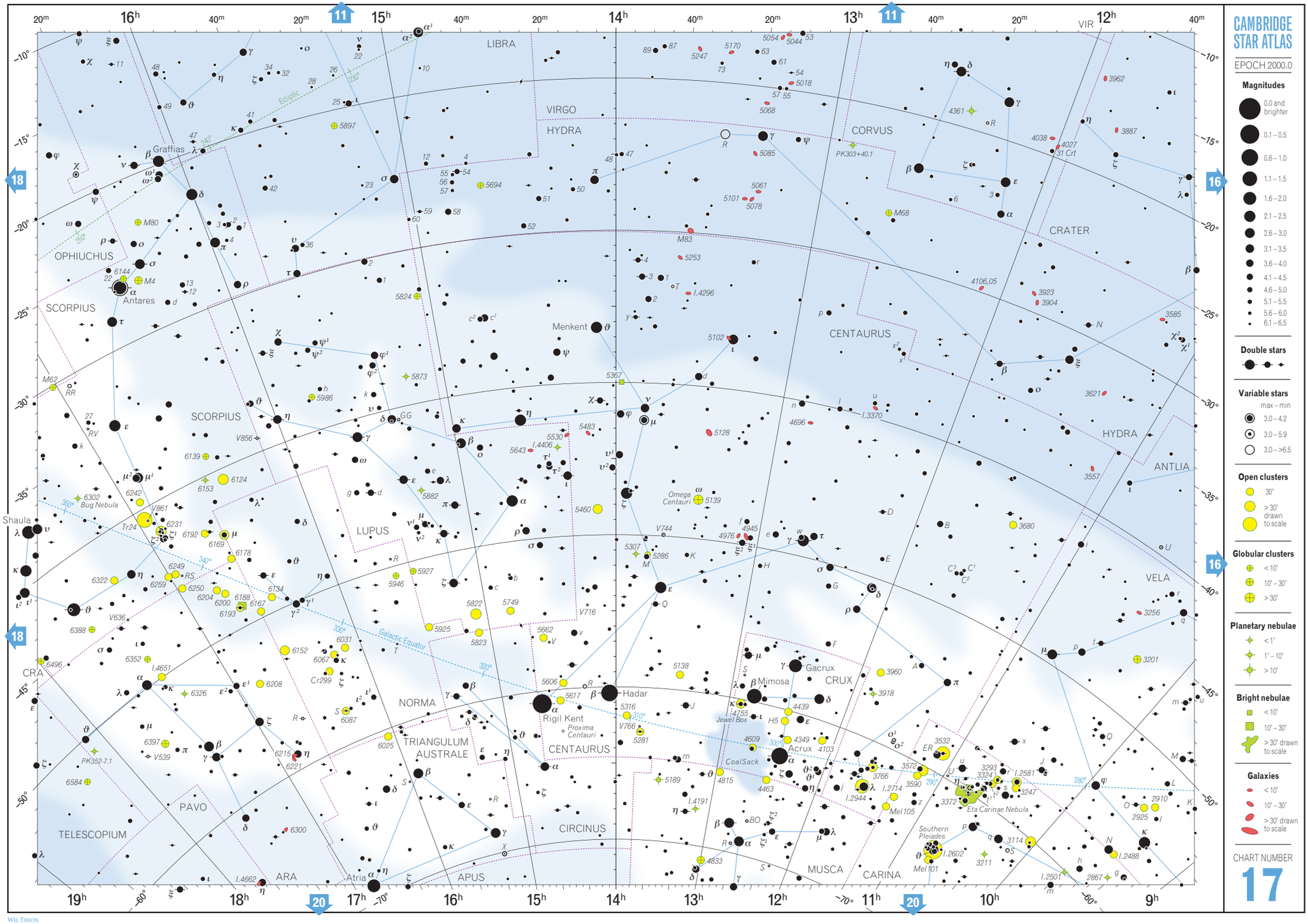

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

17

Wil Tirion

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Chart 18 *RA 16h to 20h, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum	
S	TrA	16 01.2	–63 47	6.1–6.8	Cep	6.32	F	
S	Nor	16 18.9	–57 54	6.1–6.8	Cep	9.75	F – G	
α	Sco	16 29.4	–26 26	0.9–1.8	SR	1,733	M + B	Antares
R	Ara	16 39.7	–57 00	6.0–6.9	EA	4.43	B	
RS	Sco	16 55.6	–45 06	6.2–13.0	M	320.1	M	
RR	Sco	16 56.6	–30 35	5.0–12.4	M	279.40	B	
V861	Sco	16 56.6	–40 49	6.1–6.7	EB	7.85	B	
RV	Sco	16 58.3	–33 37	6.6–7.5	Cep	6.06	F – G	
V636	Sco	17 22.8	–45 37	6.0–6.9	Cep	6.80	G	
BM	Sco	17 41.0	–32 13	5.0–6.9	SR	850:	K	
X	Sgr	17 47.6	–27 50	4.2–4.8	Cep	7.01	F	
V539	Ara	17 50.5	–53 37	5.7–6.2	EA	3.17	B + B	
W	Sgr	18 05.0	–29 35	4.3–5.1	Cep	7.59	F – G	
RS	Sgr	18 17.6	–34 06	6.0–6.9	EA	2.42	B	
V1017	Sgr	18 32.1	–29 24	6.2–14.7	ZA?	—	G	
λ	Pav	18 52.2	–62 11	3.4–4.3	Irr	—	B	
RY	Sgr	19 16.5	–33 31	6.0–15.0	RCB	—	G	
S	Pav	19 55.2	–59 12	6.6–10.4	SR	386.3	M	
RR	Sgr	19 55.9	–29 11	5.6–14.0	M	334.6	M	
RU	Sgr	19 58.7	–41 51	6.0–13.8	M	240.3	M	

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
12	Sco	16 12.3	–28 25	73	4.0	5.9 + 7.9	
σ	Sco	16 21.2	–25 36	273	20.0	2.9 + 8.5	
ε	Nor	16 27.2	–47 33	335	22.8	4.8 + 7.5	
α	Sco	16 29.4	–26 26	275	2.9	1.2 v + 5.4	Antares; var.; bin., 878 y.
36	Oph	17 15.3	–26 36	146	4.9	5.1 + 5.1	Binary, 548.7 years
γ	Ara	17 25.4	–56 23	328	17.9	3.3 + 10.3	
η	Sgr	18 17.6	–36 46	105	3.6	3.2 + 7.8	
ξ	Pav	18 23.2	–61 30	154	3.3	4.4 + 8.6	
21	Sgr	18 25.3	–20 32	289	1.8	4.9 + 7.4	
λ	CrA	18 43.8	–38 19	214	29.2	5.1 + 9.7	
γ	CrA	19 06.4	–37 04	55	1.3	4.8 + 5.1	Binary, 120.4 years
π	Sgr	19 09.8	–21 01	150	0.1	3.7 + 3.7	
				122	0.4	5.9	
β¹	Sgr	19 22.6	–44 28	77	28.3	4.0 + 7.1	
52	Sgr	19 36.7	–24 53	170	2.5	4.7 + 9.2	

Open clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
6025		TrA	16 03.7	–60 30	5.1	12	60	
6067		Nor	16 13.2	–54 13	5.6	13	100	
—	Cr 299	Cep	16 18.4	–55 07	6.9	20		
6087		Nor	16 18.9	–57 54	5.4	12	40	
6124		Sco	16 25.6	–40 40	5.8	29	100	
6134		Nor	16 27.7	–49 09	7.2	7		
6169		Lup	16 34.1	–44 03	6.6	7	40	Surrounds μ Normae
6167		Nor	16 34.4	–49 36	6.7	8		
6178		Sco	16 35.7	–45 38	7.2	4	12	
6193		Ara	16 41.3	–48 46	5.2	15		
6200		Ara	16 44.2	–47 29	7.4	12	40	
6208		Ara	16 49.5	–53 49	7.2	16	60	
6231		Sco	16 54.0	–41 48	2.6	15		
6242		Sco	16 55.6	–39 30	6.4	9		
6250		Ara	16 58.0	–45 48	5.9	8	60	
6322		Sco	17 18.5	–42 57	6.0	10	30	
I.4651		Ara	17 24.7	–49 57	6.9	12	80	
6383		Sco	17 34.8	–32 34	5.5	5	40	
6405	M6	Sco	17 40.1	–32 13	4.2	15	80	Butterfly Cluster
6416		Sco	17 44.4	–32 21	4.7	18	40	
6425		Sgr	17 46.9	–31 32	7.2	8	35	
6475	M7	Sco	17 53.9	–34 49	3.3	80	80	Ptolemy's Cluster
6520		Sgr	18 03.4	–27 54	7.6	6	60	
6531	M21	Sgr	18 04.6	–22 30	5.9	13	17	
6530		Sgr	18 04.8	–24 20	4.6	15		In M8

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
6093	M80	Sco	16 17.0	–22 59	7.2	8.9
6121	M4	Sco	16 23.6	–26 32	5.9	26.3
6144		Sco	16 27.3	–26 02	9.1	9.3
6139		Sco	16 27.7	–38 51	9.2	5.5
6266	M62	Oph	17 01.2	–30 07	6.6	14.1
6273	M19	Oph	17 02.6	–26 16	7.2	13.5
6284		Oph	17 04.5	–24 46	9.0	5.6
6287		Oph	17 05.2	–22 42	9.2	5.1
6293		Oph	17 10.2	–26 35	8.2	7.9
6304		Oph	17 14.5	–29 28	8.4	6.8
6316		Oph	17 16.6	–28 08	9.0	4.9
6352		Ara	17 25.5	–48 25	8.2	7.1
6388		Sco	17 36.3	–44 44	6.9	8.7
6397		Ara	17 40.7	–53 40	5.7	25.7
6441		Sco	17 50.2	–37 03	7.4	7.8
6496		Sco	17 59.0	–44 16	9.2	6.9
6544		Sgr	18 07.3	–25 00	8.3	8.9
6541		CrA	18 08.0	–43 42	6.7	13.1
6553		Sgr	18 09.3	–25 54	8.3	8.1
6569		Sgr	18 13.6	–31 50	8.7	5.8
6584		CrA	18 18.6	–52 13	9.2	7.9
6624		Sgr	18 23.7	–30 22	8.3	5.9
6626	M28	Sgr	18 24.5	–24 52	6.9	11.2
6638		Sgr	18 30.9	–25 30	9.2	5.0
6637	M69	Sgr	18 31.4	–32 21	7.7	7.1
6642		Sgr	18 31.9	–23 29	8.8	4.5
6652		Sgr	18 35.8	–32 59	8.9	3.5
6656	M22	Sgr	18 36.4	–23 54	5.1	24.0
6681	M70	Sgr	18 43.2	–32 18	8.1	7.8
6715	M54	Sgr	18 55.1	–30 29	7.7	9.1
6717		Sgr	18 55.1	–22 42	9.2	3.9
6723		Sgr	18 59.6	–36 38	7.3	11.0
6752		Pav	19 10.9	–59 59	5.4	20.4
6809	M55	Sgr	19 40.0	–30 58	7.0	19.0

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
6188, 6193		Ara	16 40.5	–48 47	E + R	20 × 12		
6514	M20	Sgr	18 02.6	–23 02	E + R	29 × 27	7.6	Trifid Nebula
6523	M8	Sgr	18 03.8	–24 23	E	90 × 40	0.0	Lagoon Nebula

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
6153		Sco	16 31.5	–40 15	11.5	25		
I.4634		Oph	17 01.6	–21 50	10.7	9	15 p	
6302		Sco	17 13.7	–37 06	12.8	50		Bug Nebula
6326		Ara	17 20.8	–51 45	12.2	14	13.5	
6369		Oph	17 29.3	–23 46	12.9	30/66	14.7	
—	PK352–7.1	Ara	18 00.2	–38 50	11.4	25		
I.4699		CrA	18 18.5	–45 59	11.9	10		
6629		Sgr	18 25.7	–23 12	11.6	15	12.8	
—	PK3–14.1	Sgr	18 55.6	–32 16	10.9	4	18 p	
I.1297		CrA	19 17.4	–39 37	10.7	7	12.9	

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
6215		Ara	16 51.1	–58 59	11.8	2.0 × 1.6	Sc
6221		Ara	16 52.8	–59 13	11.5	3.2 × 2.3	SBc
6300		Ara	17 17.0	–62 49	11.1	5.4 × 3.5	SBc
I.4662		Pav	17 47.1	–64 38	11.4	2.2 × 1.4	Irr
6744		Pav	19 09.8	–63 51	9.0	15.5 × 10.2	SBb
6753		Pav	19 11.4	–57 03	11.9	2.5 × 2.2	Sb

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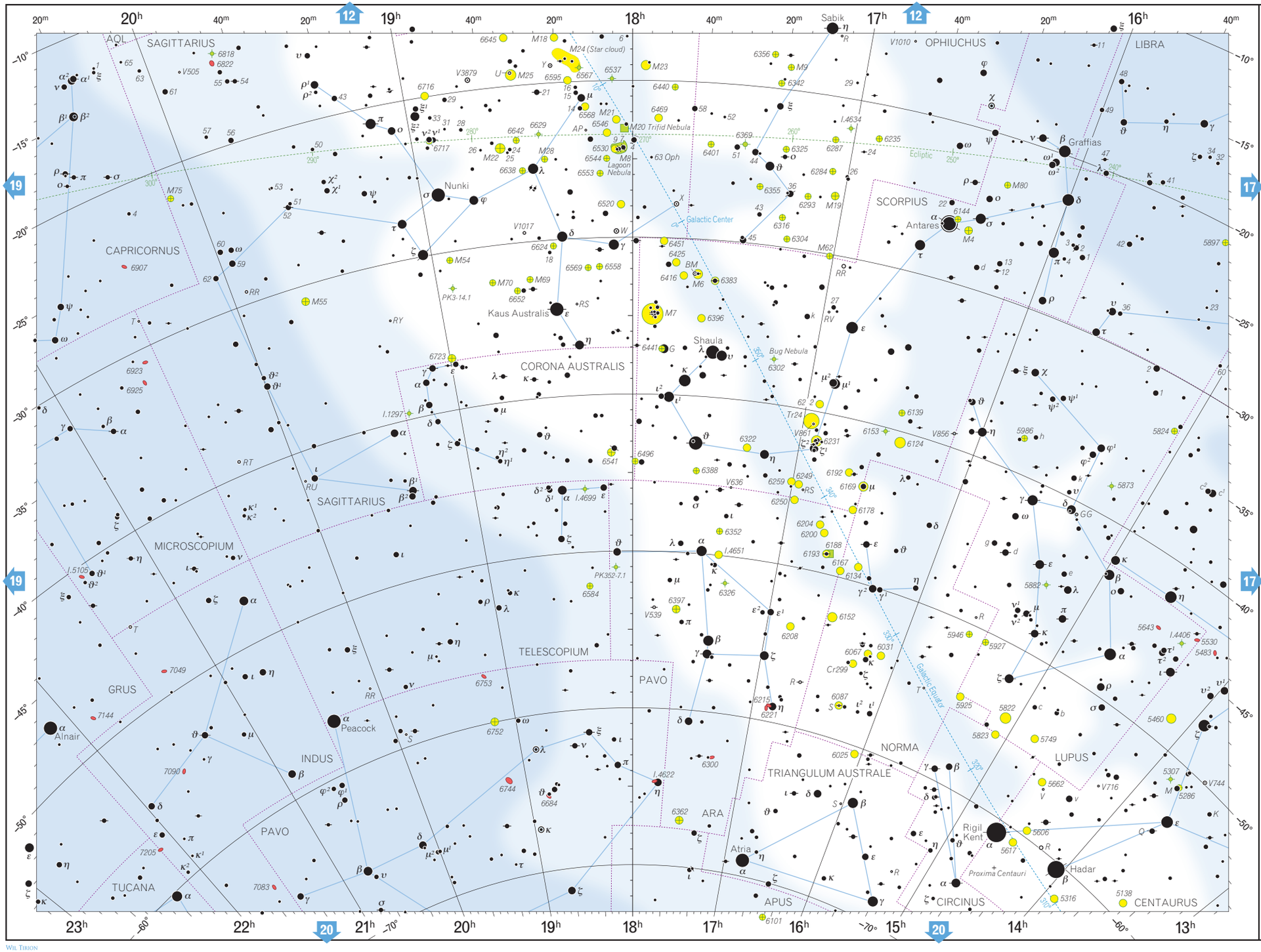

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

18

Wil Tirion

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Chart 19 *RA 20h to 0h, declination –20° to –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
RR	Tel	20 04.2	–55 43	6.5–16.5 p	ZA	—	F
RT	Sgr	20 17.7	–39 07	6.0–14.1	M	305.3	M
T	Mic	20 27.9	–28 16	7.7–9.6 p	SR	344	M
T	Ind	21 20.2	–45 01	5.5–6.5	SR	320:	M
T	Gru	22 25.7	–37 34	7.8–12.3 p	M	136.5	M
S	Gru	22 26.1	–48 26	6.0–15.0	M	401.4	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes
α	Mic	20 50.0	–33 47	166	20.5	5.0 + 10.0
ϑ	Ind	21 19.9	–53 27	275	6.0	4.5 + 7.0
η	PsA	22 00.8	–28 27	115	1.7	5.8 + 6.8
41	Aqr	22 14.3	–21 04	114	5.0	5.6 + 7.1
δ	Tuc	22 27.3	–64 58	282	6.9	4.5 + 9.0
β	PsA	22 31.5	–32 21	172	30.3	4.9 + 7.9
γ	PsA	22 52.5	–32 53	262	4.2	4.5 + 8.0
δ	PsA	22 55.9	–32 32	244	5.0	4.2 + 9.2
υ	Gru	23 06.9	–38 54	211	1.1	5.7 + 8.0
ϑ	Gru	23 06.9	–43 31	75	1.1	4.5 + 7.0

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′
6864	M75	Sgr	20 06.1	–21 55	8.6	6.0
7099	M30	Cap	21 40.4	–23 11	7.5	11.0

Planetary nebula

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*	
7293		Aqr	22 29.6	–20 48	7.3	769	13.8	Helix Nebula

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
6907		Cap	20 25.1	–24 49	11.3	3.4 × 3.0	SBb
6923		Mic	20 31.7	–30 50	12.1	2.5 × 1.4	Sb
6925		Mic	20 34.3	–31 59	11.3	4.1 × 1.6	Sb
7049		Ind	21 19.0	–48 34	10.7	2.8 × 2.2	S0
I.5105		Mic	21 24.4	–40 37	11.5	2.5 × 1.5	E4
7083		Ind	21 35.7	–63 54	11.8	4.5 × 2.9	Sb
7090		Ind	21 36.5	–54 33	11.1	7.1 × 1.4	SBc
7144		Gru	21 52.7	–48 15	10.7	3.5 × 3.5	E0
7172		PsA	22 02.0	–31 52	11.9	2.2 × 1.3	S
7174		PsA	22 02.1	–31 59	12.6	1.3 × 0.7	S
7176		PsA	22 02.1	–31 59	11.9	1.3 × 1.3	E0
7184		Aqr	22 02.7	–20 49	12.0	5.8 × 1.8	Sb
7205		Ind	22 08.5	–57 25	11.4	4.3 × 2.2	Sb
7221		PsA	22 11.3	–30 37	12 :	2.2 × 1.9	SBb
7314		PsA	22 35.8	–26 03	10.9	4.6 × 2.3	Sc
7410		Gru	22 55.0	–39 40	10.4	5.5 × 2.0	SBa
7412		Gru	22 55.8	–42 39	11.4	4.0 × 3.1	SBb
7418		Gru	22 56.6	–37 02	11.4	3.3 × 2.8	SBc
I.1459		Gru	22 57.2	–36 28	10.0	3.4 × 2.5	E3
I.5267		Gru	22 57.2	–43 24	10.5	5.0 × 4.1	S0
7424		Gru	22 57.3	–41 04	10.5	7.6 × 6.8	SBc
7456		Gru	23 02.1	–39 35	11.9	5.9 × 1.8	Sc
7496		Gru	23 09.8	–43 26	11.1	3.5 × 2.8	SBb
7531		Gru	23 14.8	–43 36	11.3	3.5 × 1.5	Sb
7552		Gru	23 16.2	–42 35	10.7	3.5 × 2.5	SBb
7582		Gru	23 18.4	–42 22	10.6	4.6 × 2.2	SBb
7599		Gru	23 19.3	–42 15	11.4	4.4 × 1.5	Sc
I.5332		Scl	23 34.5	–36 06	10.6	6.6 × 5.1	Sd
7713		Scl	23 36.5	–37 56	11.6	4.3 × 2.0	SBd
7755		Scl	23 47.9	–30 31	11.8	3.7 × 3.0	SBb
7793		Scl	23 57.8	–32 35	9.1	9.1 × 6.6	Sd

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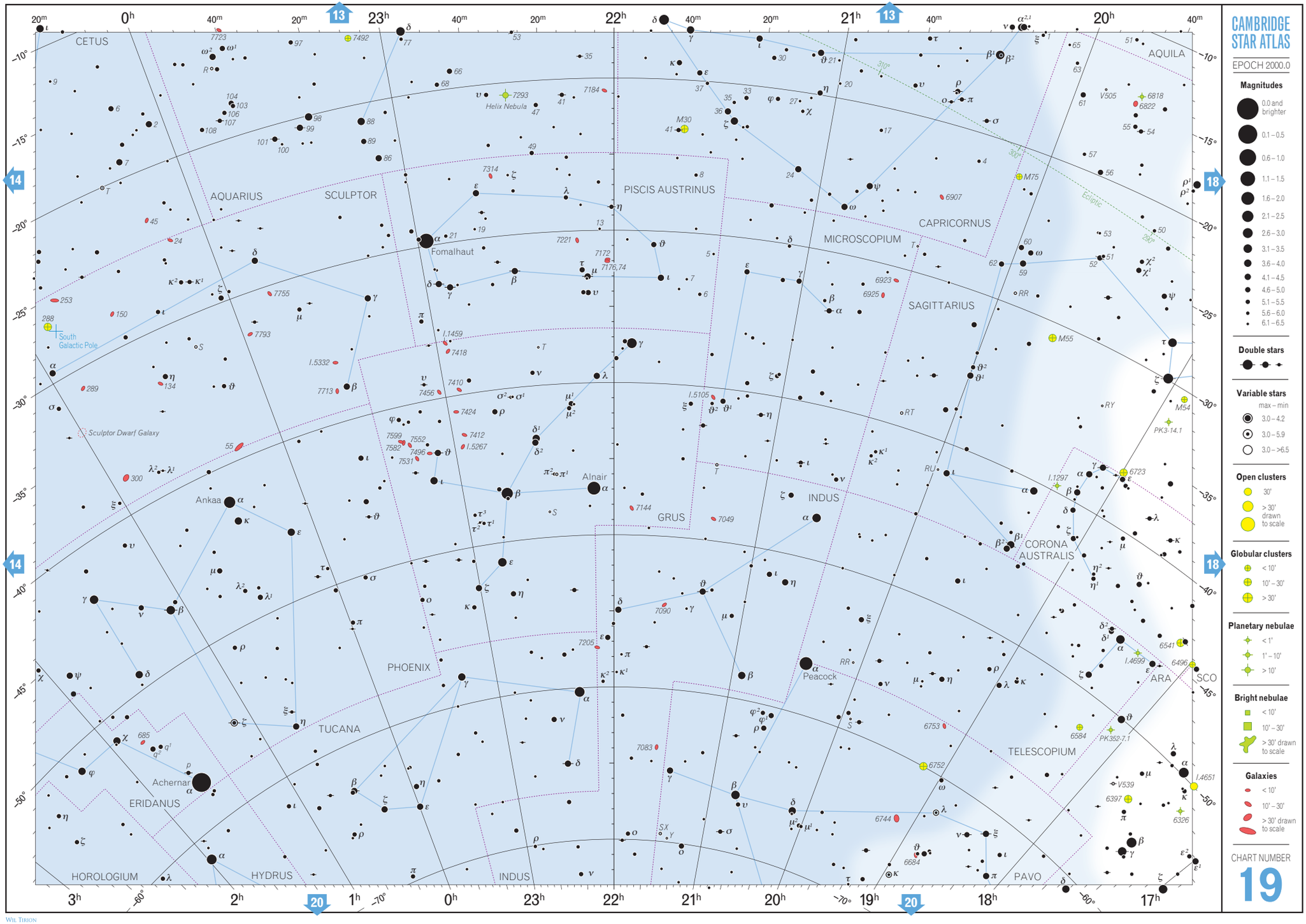

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

- 0.0 and brighter
- 0.1 – 0.5
- 0.6 – 1.0
- 1.1 – 1.5
- 1.6 – 2.0
- 2.1 – 2.5
- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
- 6.1 – 6.5

Double stars

Variable stars

max – min

- 3.0 – 4.2
- 3.0 – 5.9
- 3.0 – >6.5

Open clusters

- 30'
- > 30' drawn to scale

Globular clusters

- < 10'
- 10' – 30'
- > 30'

Planetary nebulae

- < 1'
- 1' – 10'
- > 10'

Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

19

Wil Tirion

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Chart 20 *South of declination –65°*

Variable stars

Star	Con	RA h m	Dec ° ′	Range	Type	Period (days)	Spectrum
U	**Men**	04 09.6	–81 51	8.0–10.9 p	**M**	407	M
R	**Oct**	05 26.1	–86 23	6.4–13.2	**M**	405.6	M
TZ	**Men**	05 30.2	–84 47	6.2–6.9	**EA**	8.57	B
RS	**Cha**	08 43.2	–79 04	6.0–6.7	**EA + δSct**	1.67	A + A
S	**Mus**	12 12.8	–70 09	5.9–6.4	**Cep**	9.66	F
BO	**Mus**	12 34.9	–67 45	6.0–6.7	**Irr**	—	M
R	**Mus**	12 42.1	–69 24	5.9–6.7	**Cep**	7.48	B
J	**Aps**	13 08.1	–65 18	6.4 –8.6	**SR**	199	B
X	**TrA**	15 14.3	–70 05	5.0–6.4	**Irr**	—	K
R	**TrA**	15 19.8	–66 30	6.4–6.9	**Cep**	3.39	G
κ	**Pav**	18 16.9	–67 14	3.9–4.6	**Cep**	9.09	F
Y	**Pav**	21 24.3	–69 44	5.6–7.3	**SR**	233.3	M
SX	**Pav**	21 28.7	–69 30	5.4–6.0	**SR**	50:	M

Double stars

Star	Con	RA h m	Dec ° ′	PA °	Sep ″	Magnitudes	
κ	**Tuc**	01 15.8	–68 53	336	5.4	5.1 + 7.3	
γ	**Vol**	07 08.8	–70 30	300	13.6	4.0 + 5.9	
ζ	**Vol**	07 41.8	–72 36	116	16.7	4.0 + 9.8	
κ	**Vol**	08 19.8	–71 31	57	65.0	5.4 + 5.7	
ε	**Cha**	11 59.6	–78 13	188	0.9	5.4 + 6.0	
β	**Mus**	12 46.3	–68 06	43	1.3	3.7 + 4.0	Binary, 383.1 years
ι	**Oct**	12 55.0	–85 07	230	0.6	6.0 + 6.5	
ϑ	**Mus**	13 08.1	–65 18	187	5.3	5.7 + 7.3	
$\delta^{1,2}$	**Aps**	16 20.3	–78 42	12	102.9	4.7 + 5.1	
μ^2	**Oct**	20 41.7	–75 21	17	17.4	7.1 + 7.6	
λ	**Oct**	21 50.9	–82 43	70	3.1	5.4 + 7.7	

Open cluster

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	N*	
—	Mel 101	**Car**	10 42.1	–65 06	8.0:	14	50	Close to I.2602

Globular clusters

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Diam ′	
104		**Tuc**	00 24.1	–72 05	4.0	30.9	47 Tucanae
362		**Tuc**	01 03.2	–70 51	6.6	12.9	
4372		**Mus**	12 25.8	–72 40	7.8	16.8	
4833		**Mus**	12 59.6	–70 53	7.4	13.5	
6101		**Aps**	16 25.8	–72 12	9.3	10.7	
6362		**Ara**	17 31.9	–67 03	8.3	10.7	

Bright diffuse nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Type	Diam ′	Mag*	
2070	30 Dor	**Dor**	05 38.7	–69 06	**E**	40 × 25		Tarantula Nebula in LMC[a]

Planetary nebulae

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag p	Diam ″	Mag*
I.2448		**Car**	09 07.1	–69 57	11.8	8	12.9
I.4191		**Mus**	13 08.8	–67 39	12.0	5	
5189		**Mus**	13 33.5	–65 59	10.3	153	14.0

Galaxies

NGC/IC	Other	Con	RA h m	Dec ° ′	Mag	Size ′	Type
1313		**Ret**	03 18.3	–66 30	9.4	8.5 × 6.6	**SB**
2442		**Vol**	07 36.4	–69 32	11.2	6.0 × 5.5	**SB**
3059		**Car**	09 50.2	–73 55	12.0	3.2 × 3.0	**SB**
6684		**Pav**	18 49.0	–65 11	11.4	3.7 × 2.7	**SB**

[a]LMC Large Magellanic Cloud: see page 81.

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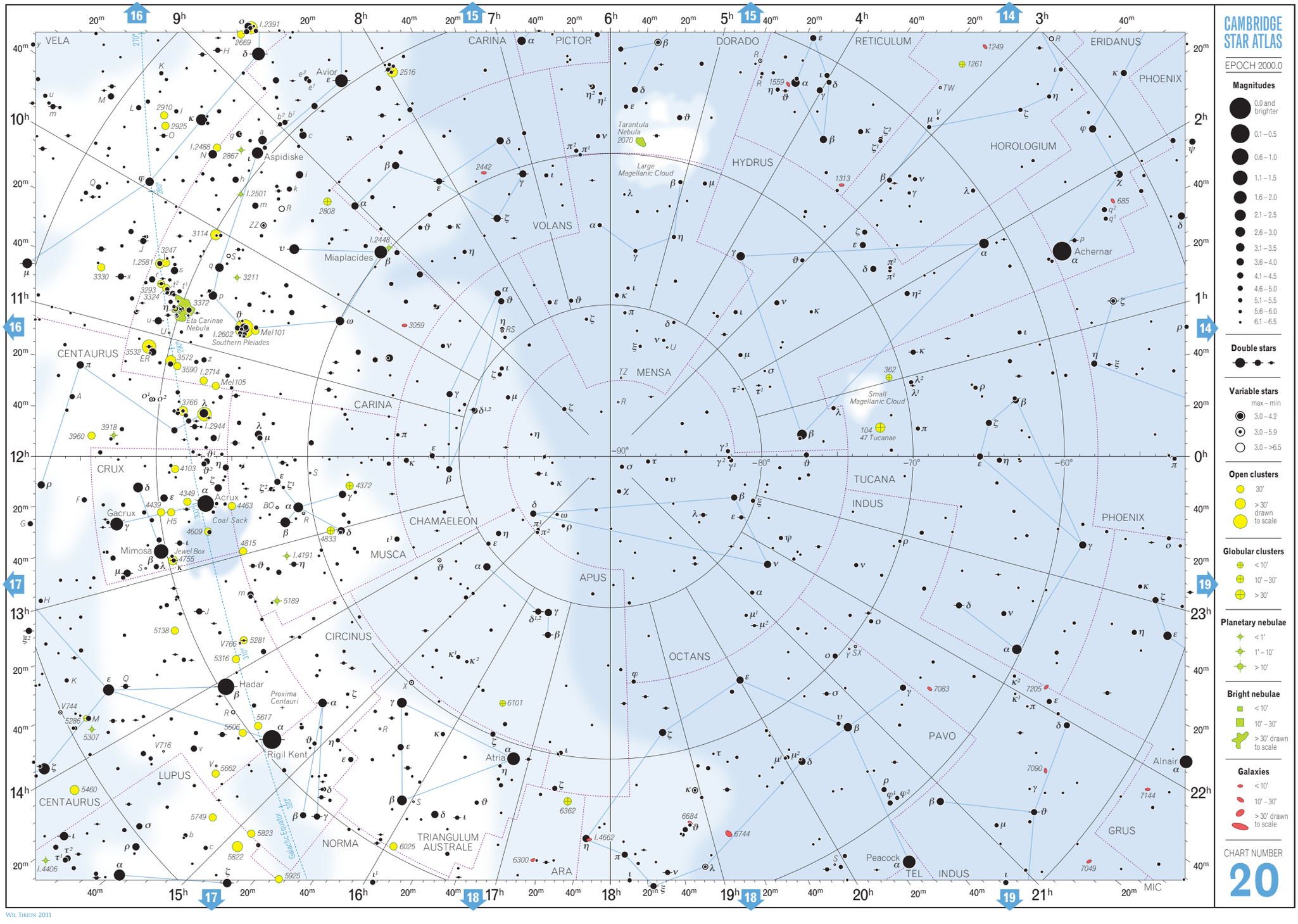

CAMBRIDGE STAR ATLAS

EPOCH 2000.0

Magnitudes

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- 1.6 – 2.0
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- 2.6 – 3.0
- 3.1 – 3.5
- 3.6 – 4.0
- 4.1 – 4.5
- 4.6 – 5.0
- 5.1 – 5.5
- 5.6 – 6.0
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- 1' – 10'
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Bright nebulae

- < 10'
- 10' – 30'
- > 30' drawn to scale

Galaxies

- < 10'
- 10' – 30'
- > 30' drawn to scale

CHART NUMBER

20

Wil Tirion 2011

ALL-SKY MAPS

This part of *The Cambridge Star Atlas* consists of six all-sky maps to show the general distribution of different objects in the sky. Each of the six maps shows the whole sky in a so-called 'equal-area' projection; the *Mollweide* projection, named after the man who invented it.

It's obvious that you cannot show the inside of the whole celestial sphere on a simple flat map, without severe distortion. There are many different projections that can be used to create an all-sky map (or a map showing the whole surface of the Earth), and every projection has its advantages and disadvantages. Mollweide's is an 'equal-area' projection, meaning that in spite of the inevitable distortion the actual area covered by one square degree remains the same, no matter where on the map it is measured. So the distribution, or density of objects, is not influenced by the map's projection. Since that is the goal of these maps, the disadvantage, that the shapes of the constellations near the edges are extremely distorted, is taken for granted. If the constellation lines were not drawn, it would be hard to recognize them!

Unlike the main star charts, these maps are presented in galactic coordinates. The Galactic Equator is the central, horizontal line, marked 0°. On the main star charts it is represented as the blue dashed line, making an angle of almost 63° with the Celestial Equator. The Galactic Center (galactic longitude 0°, see star chart 18) lies close to the point where the constellations Sagittarius, Ophiuchus, and Scorpius meet, and is in the center of the galactic maps in this chapter. At the top and bottom of the maps the North Galactic Pole (NGP) and the South Galactic Pole (SGP) are marked. They can be found on the star charts 5 (in Coma Berenices) and 14 (in Sculptor) respectively.

The constellations

The first map, on page 82, gives the positions of the constellations against this unusual grid. Stars down to magnitude 4.5 are plotted, plus some fainter stars to complete the constellation patterns, as on the seasonal sky maps.

Distribution of open clusters

The second map, on page 83, shows the open star clusters as yellow disks with green outlines, plotted against the background of stars and constellations shown here blue against a black background. As explained in the introduction to the main star charts the open clusters are found near the plane of the Milky Way, so on this map you will find most of these objects close to the Galactic Equator. The map shows all clusters that are plotted on the star charts. This is also the case with the following maps of the globular clusters, the planetary nebulae, and the galaxies.

Distribution of globular clusters

The third map, on page 84, shows the globular star clusters, using the same yellow symbols that are used on the star charts. You can see that the distribution is very different from the open clusters. The globular clusters form a huge halo around the Milky Way center, so they are much more scattered than the open clusters. But since we are not in the center of our galaxy (in fact, we are closer to the edge than to the center) we see most globular clusters in the direction of the Galactic Center (i.e., in the center of the map). In the opposite direction (near 180° galactic longitude, the left- and right-hand edges of the map) they are almost absent.

Distribution of diffuse nebulae

The distribution of diffuse nebulae is shown on the fourth map, on page 85. Because on the star charts of *The Cambridge Star Atlas* only a limited number of bright diffuse nebulae are drawn, additional nebulae have been added to the all-sky map, to show their distribution properly. The light green squares are the ones drawn in *The Cambridge Star*

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Atlas, while the darker green squares represent the additional nebulae, taken from *Sky Atlas 2000.0* (second edition). As you can see, the distribution of the nebulae is quite similar to that of the open star clusters. It brings us back to the disk of the Galaxy. Like the open clusters, the diffuse nebulae are found along the spiral arms of the Milky Way. In some areas you see gaps, where the nebulae are almost absent, but this is only an illusion. Large areas of dark nebulae and clouds of dust block the light of many remote bright nebulae as well as those of other objects.

Distribution of planetary nebula

The fifth map, on page 86, shows the planetary nebulae (drawn as soft green disks with four spikes). Their distribution does not show any similarity with that of the open or the globular clusters. They are not exclusively found in the spiral arms of the Milky Way, like the open star clusters, and not in a halo, like the globular clusters. They fill a disk-like area that is much thicker than the main Milky Way disk, in which the open clusters and the diffuse nebulae are found.

Distribution of galaxies

The sixth and final map shows where the brightest galaxies, plotted on the atlas charts, can be found. Since the galaxies, shown as red ovals, are not part of the Milky Way, but are in fact very distant 'Milky Ways' themselves, there is no relation between their distribution in the sky and the distribution of objects that belong to our own Milky Way. But, looking at the map, you will get the impression that there is a relationship, since other galaxies are almost absent in the area of the Milky Way close to the Galactic Equator. This, however, has nothing to do with their real distribution in space. The enormous amounts of gas and dust in our galaxy block the light of most of the distant galaxies seen in that direction. So they only appear to be absent. However, looking at the map, it is also obvious that the galaxies are not equally spread in the areas away from the Milky Way. They are grouped into what astronomers call 'clusters' and 'superclusters', with dimensions beyond our imagination.

In the bottom-right quadrant of the map you see two large galaxies. These are the Large and the Small Magellanic Clouds. The two clouds are regarded as satellites of our own Milky Way, and therefore are shown in white on the star charts (14, 15, and 20). However, since they are officially cataloged as galaxies, they have been plotted on this map as well.

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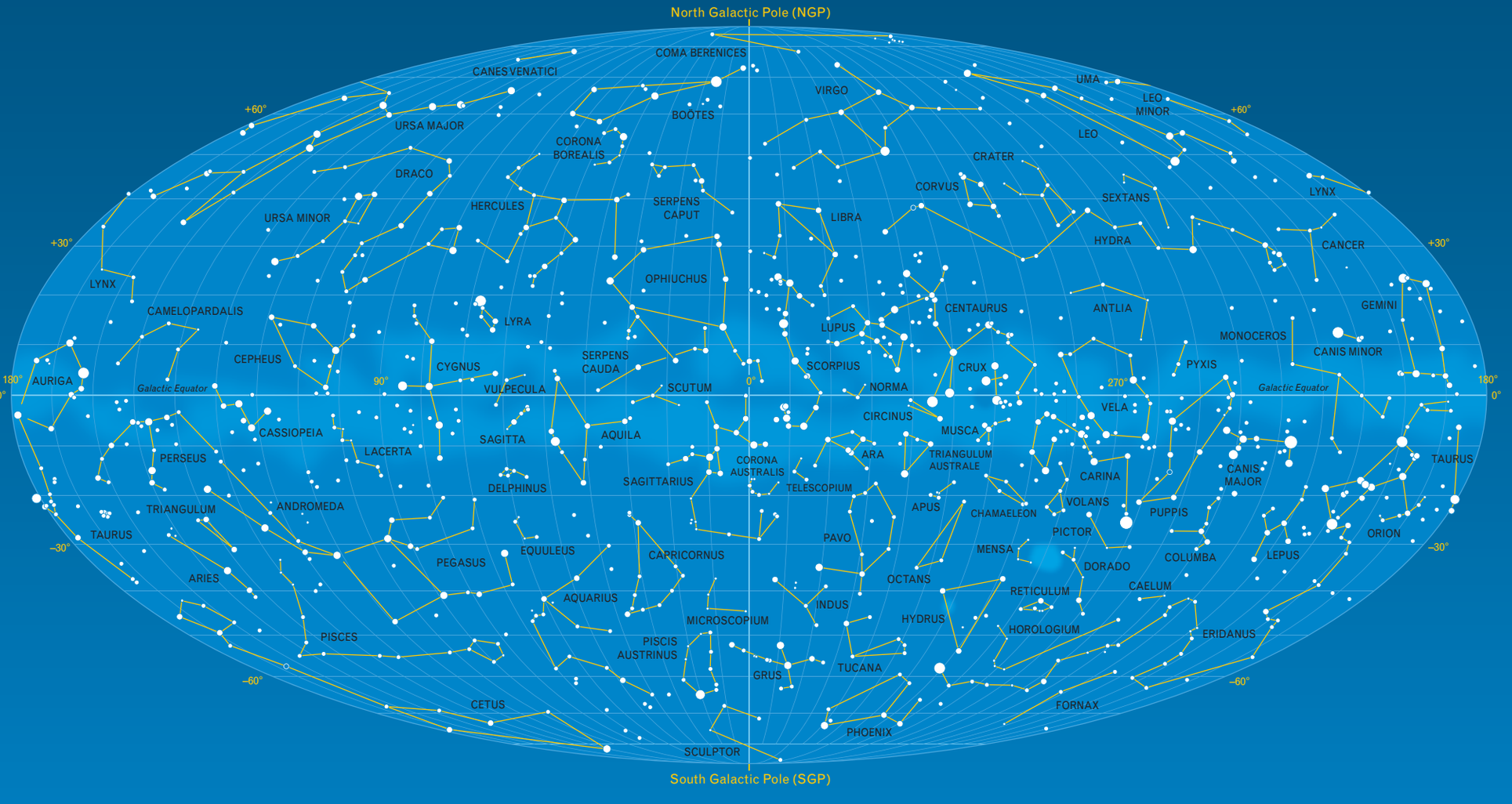
THE CONSTELLATIONS



MOLLWEIDE'S EQUAL-AREA PROJECTION

Galactic Coordinates

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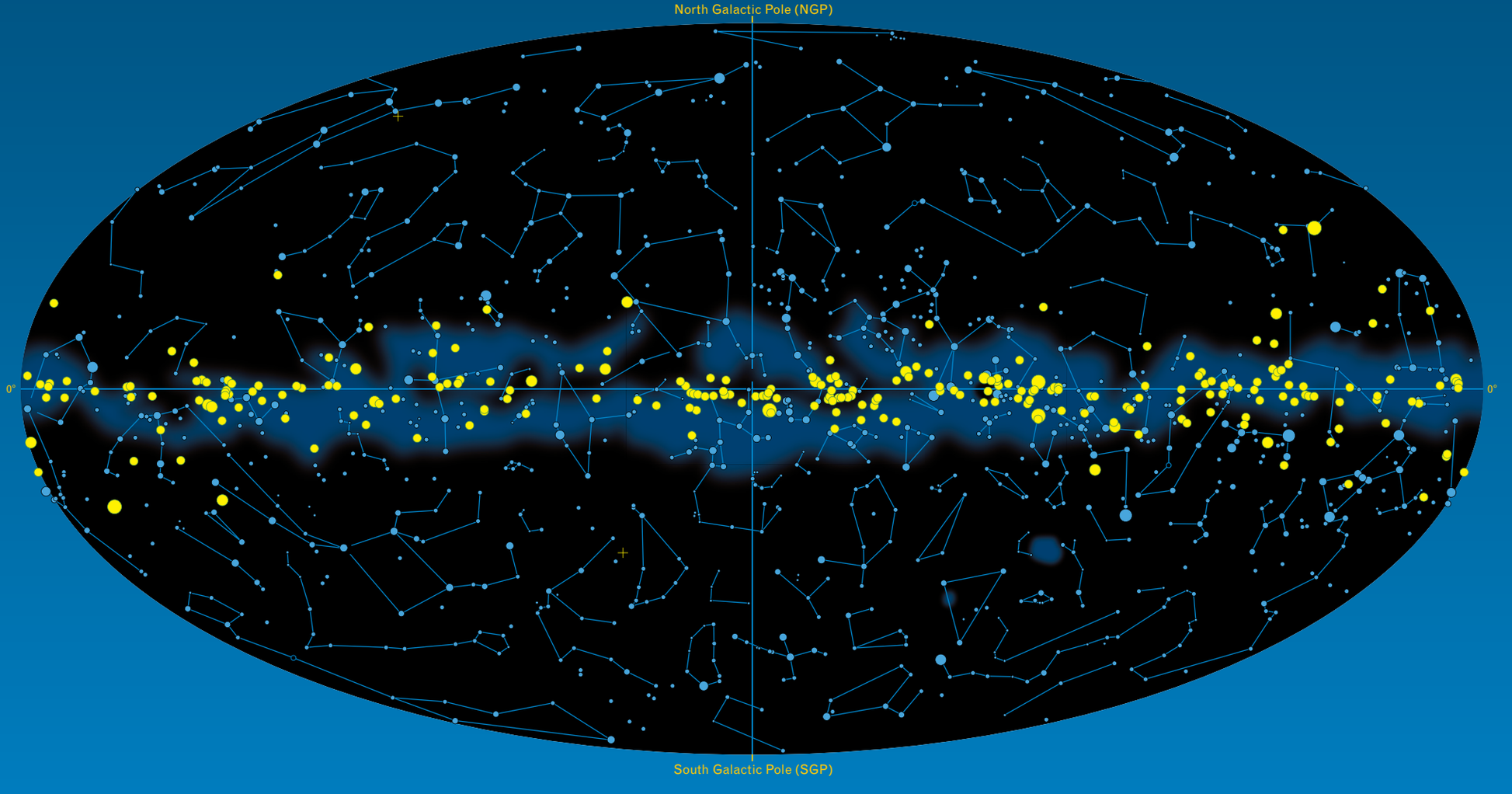

MOLLWEIDE'S EQUAL-AREA PROJECTION

Galactic Coordinates

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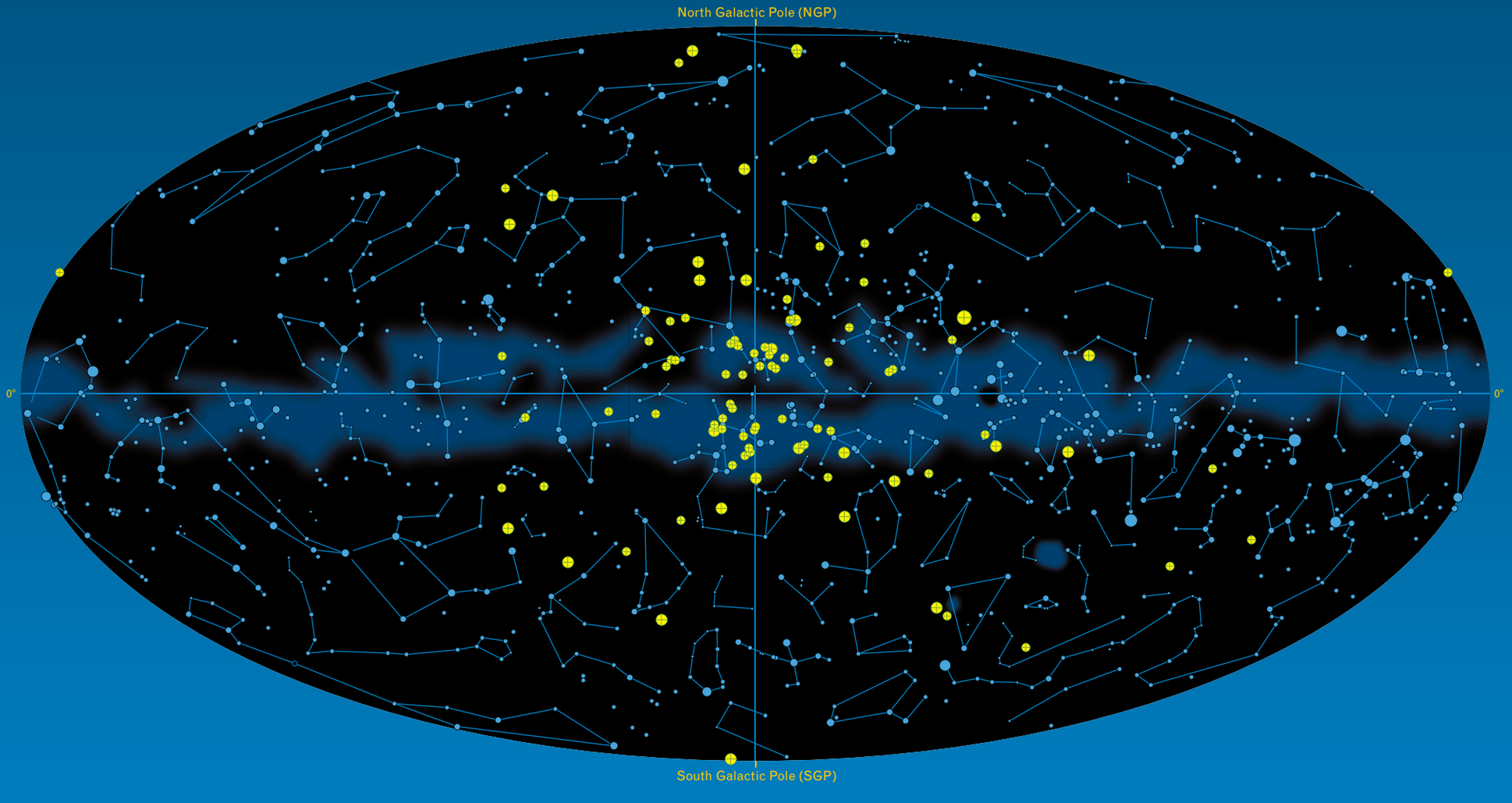
DISTRIBUTION OF GLOBULAR CLUSTERS



MOLLWEIDE'S EQUAL-AREA PROJECTION

Galactic Coordinates

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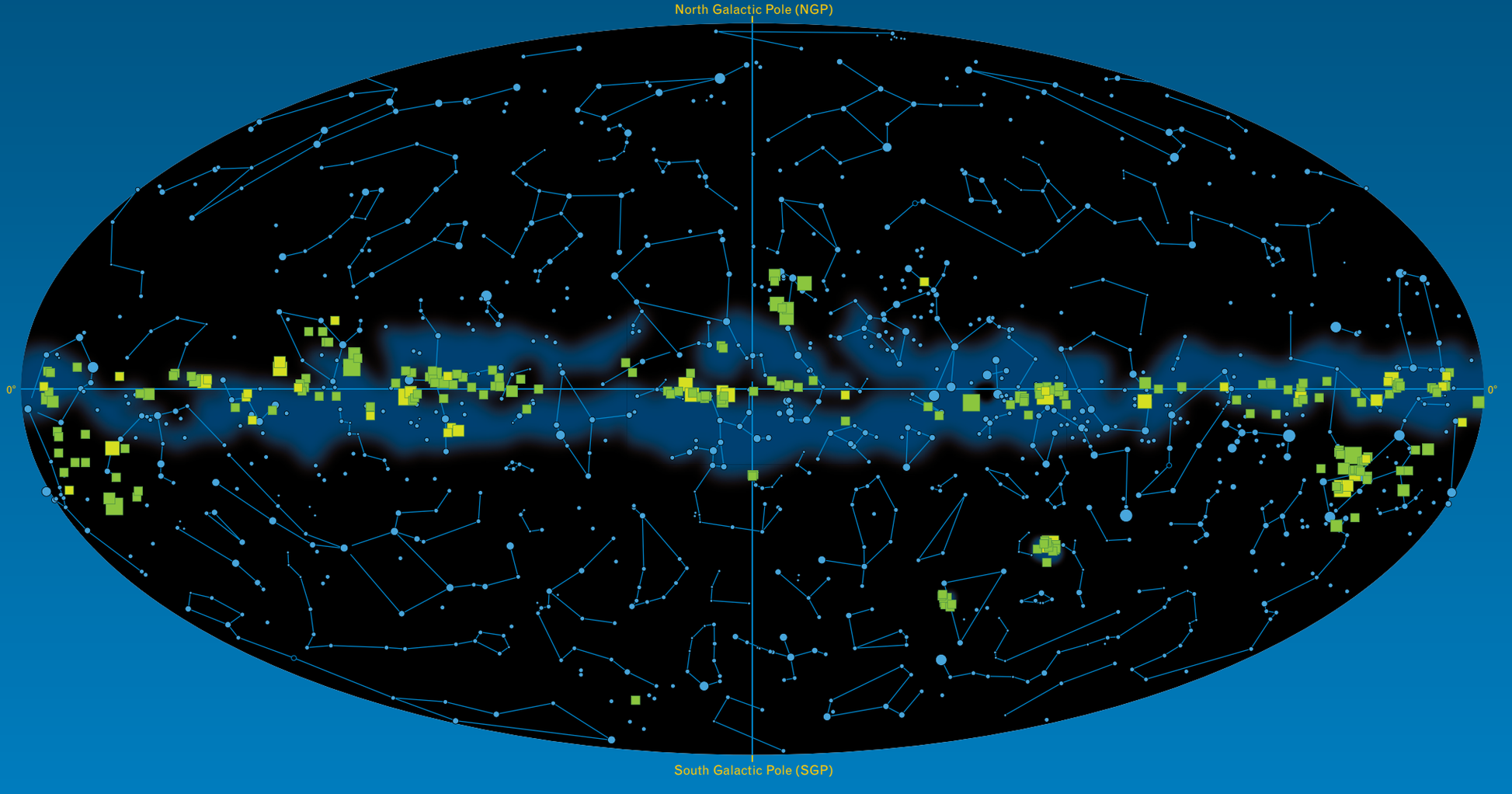
DISTRIBUTION OF DIFFUSE NEBULAE



MOLLWEIDE'S EQUAL-AREA PROJECTION

Galactic Coordinates

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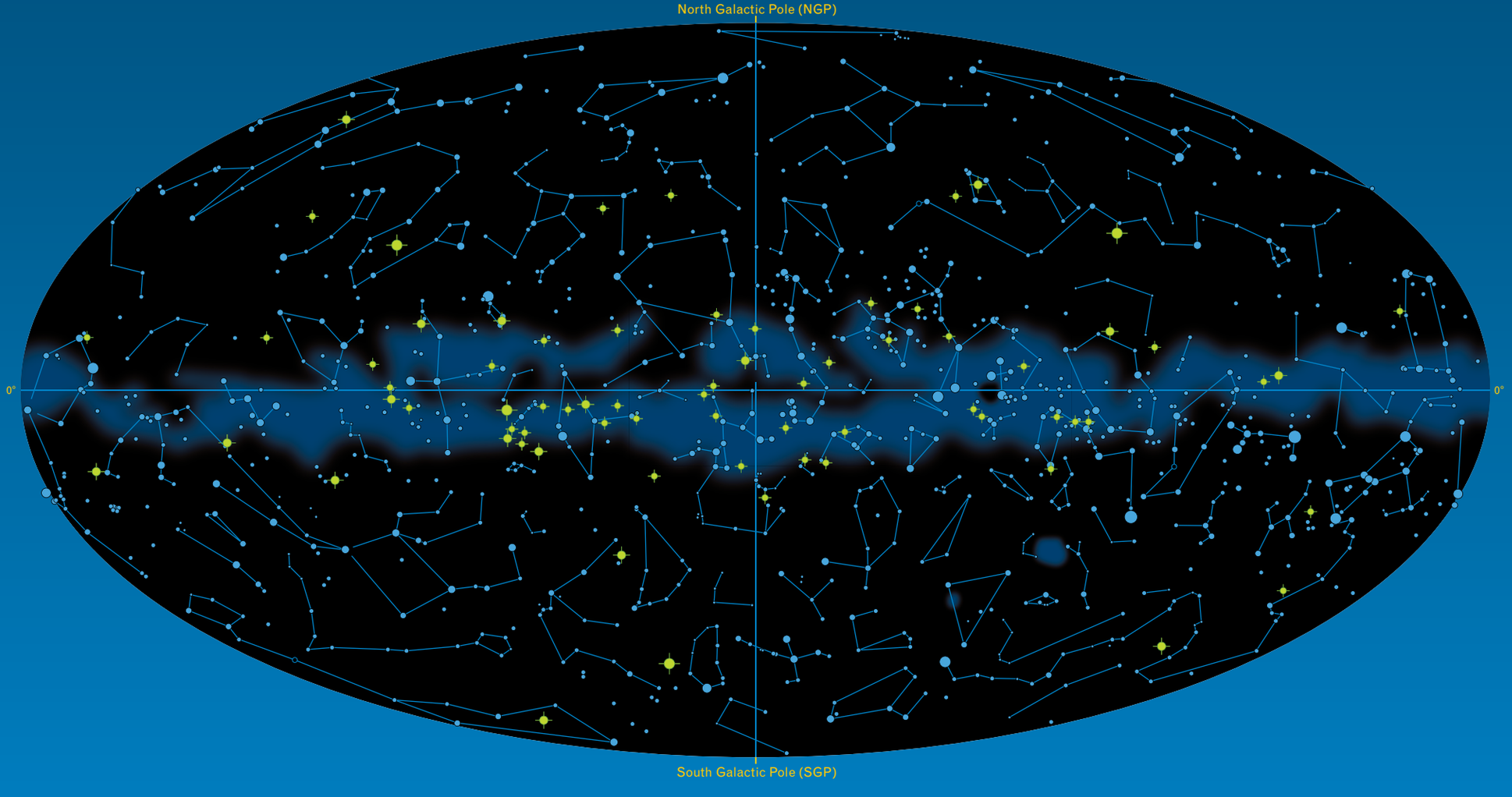
DISTRIBUTION OF PLANETARY NEBULAE



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Galactic Coordinates

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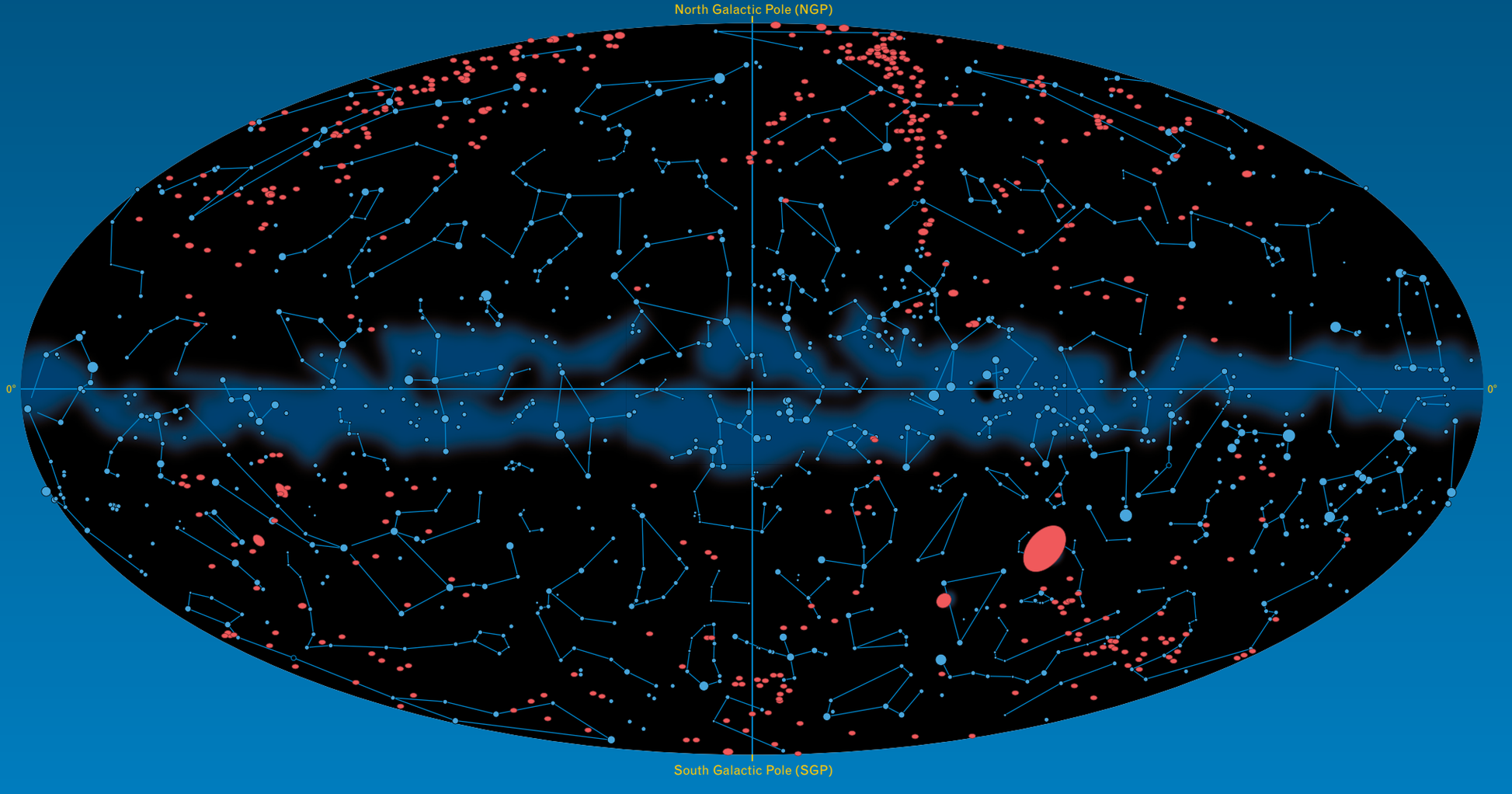

MOLLWEIDE'S EQUAL-AREA PROJECTION

Galactic Coordinates